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ABSTRACT

THE EFFECT OF A CORONARY ARTERY RISK EVALUATION PROGRAM ON THE SERUM LIPID VALUES OF A SELECTED MILITARY POPULATION

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Sandra Lyn Bruce, M.S.N.

The University of Texas at Arlington, 1991

Supervising Professor: Susan K. Grove

This study examined the efficacy of a coronary artery risk evaluation program conducted at a military installation. Based on the Precede Model of Health Education, the study tested the theoretical relationship between health education and health outcomes (Green, Kreuter, Deeds, & Partridge, 1980). Health education involved the screening and evaluation of 195 men and women for cardiovascular disease risk and an educational program, designed to facilitate positive lifestyle changes. Health outcomes were measured as serum lipid levels and cardiovascular risk levels (low, moderate, or high risk). These outcomes were measured pre- and six months post-participation in the program. Findings indicate significant improvements in serum lipid values. Mean total cholesterol levels fell 13.15% (t_{194}=-16.76, p=0.000), LDL levels fell 17% (t_{194}=-15.22, p=0.000) and HDL levels rose by 5.8% (t_{194}=3.27, p=0.000). Overall, cardio-

vascular risk levels were lowered from high to moderate risk and moderate to low risk (x^2 = 98.28, p=0.000).

THE EFFECT OF A CORONARY ARTERY RISK EVALUATION PROGRAM ON THE SERUM LIPID VALUES OF A SELECTED MILITARY POPULATION

by

SANDRA LYN BRUCE

Presented to the Faculty of the Graduate School of
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for the Degree of

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THE EFFECT OF A CORONARY ARTERY RISK EVALUATION PROGRAM ON

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The members of the Committee approve the masters
thesis of Sandra Lyn Bruce

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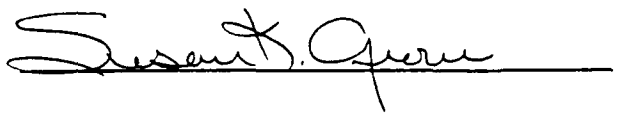

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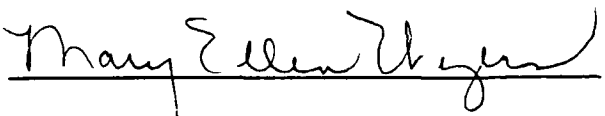

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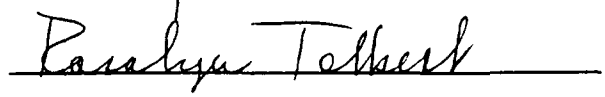

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CHAPTER I

INTRODUCTION

Nurses, as professionals interested in health care, should lead society's efforts to develop and adhere to healthy lifestyles that will minimize disease and promote wellness. If we are to accomplish these goals, we must consider clients not as passive recipients of care, but as active self-directed participants. Furthermore, we must help them appreciate that they need not be passive victims of health problems.

An individual's health is determined by heredity, environment and behavioral choice. The public has demonstrated an increasing awareness of the benefits of lifestyle modification, and more individuals are actively working for wellness. There are more health clubs, health food establishments and behavior modification programs in existence than ever before. The television and news media promote fitness and offer information on this subject daily. Numerous commercial products now laud their healthful benefits. Nontheless, there continue to be disease processes that could be lessened through lifestyle modification. The most significant of these is coronary artery disease (CAD).

Heart disease continues to be the leading cause of death in the United States. Between 1966 and 1986, the combined rate for

all cardiovascular disease declined by 42%, more than three times greater than the decline for all other deaths combined (National Institutes of Health, 1987). Despite this progress, cardiovascular diseases still cause nearly one of every two deaths. For adults forty-five years and older, heart disease is still the leading cause of death (American Heart Association, 1988). "It accounts for more deaths annually than any disease, including all forms of cancer combined. It ranks first in terms of social security disability and second only to all forms of arthritis for limitation of activity, and to all forms of cancer combined for total hospital days. In direct health care costs, lost wages, and productivity, coronary heart disease (CHD) costs the United States more than $60 billion a year" (Lipid Research Clinics, 1984, p. 351).

Risk factors for CAD include age, gender, family history, high cholesterol, blood pressure, smoking, and severe obesity. The last four risk factors can be modified with lifestyle changes. Changing eating patterns will reduce the average individual's blood cholesterol level by 10%. Studies reveal that removal of cholesterol from the diet will cause atherosclerotic lesions to recede (O'Brien & Dedmon, 1990). Recent data from the National Center for Health Statistics suggest that slightly over 50% of Americans aged 20-74 have total blood cholesterol levels above the desirable level of 200 mg/dl. About 25% of the adult population is at high risk of coronary heart disease due to levels of 240 mg/dl or greater and are candidates for intervention (Sempos et al., 1989). Despite increased public

awareness, many victims of CAD continue to choose an unhealthy diet and to lead a sedentary lifestyle.

The current challenge for nurse researchers is to develop and refine knowledge needed to assist both individuals and populations to reduce their risk of heart disease. In 1971, results of the Framingham study clearly demonstrated that the risk of coronary heart disease (CHD) was directly correlated with total cholesterol levels. This landmark study increased public awareness of the relation between elevated cholesterol levels and the risk of CHD (Kannel, Castelli, Gordon, & McNamara, 1971). In addition, results of the Lipid Research Clinics Coronary Primary Prevention trial (1984) demonstrated that reducing low density lipoproteins (LDLs), the primary carrier of cholesterol, decreases the risk of CHD. Findings in this large-scale study demonstrated that a 10.4% decrease in LDLs was associated with a 16% to 19% reduction in CHD. Both dietary and pharmacologic interventions reduced low density lipoproteins and serum cholesterol levels.

The goals of risk factor reduction are disease prevention, delay of disease onset, and slowing of disease progression (Grundy, 1986). Risk strategies were defined by the World Health Organization as various approaches to prevent cardiovascular disease. Two approaches have been advocated. The first is the public health approach, where public education is used to stimulate the nation to reduce risk factors. The second approach is to identify and intervene with those

individuals who have high risk-factor values obtained by screening and/or by family history (Downey, Cresanta, & Berenson, 1989). The nursing profession could play an integral role in facilitating risk reduction changes in "at risk" populations by effectively screening, educating and monitoring individuals with specific needs.

Statement of the Problem

The evidence supporting a causal relationship between blood cholesterol levels and coronary heart disease comes from a large body of congruent findings from epidemiologic, observational and intervention studies (Grundy, 1986; Lipid Research Clinics Program, 1984). There is a consensus that detection and intervention for persons with elevated serum cholesterol levels could reduce, in part, their overall risk for coronary heart disease. Several randomized trials in the United States and Europe have shown that reduction in elevated cholesterol levels through dietary and drug interventions can effectively decrease the incidence of coronary heart disease (Lipid Research Clinics Program, 1984; Brown, 1983; Grande, 1983). Current knowledge regarding patient and public education for cholesterol lags behind the epidemiological and clinical evidence which forms the basis for controlling blood cholesterol levels (Glanz, 1988). The question remains, do health education interventions effect positive changes in health outcomes?

Several nurse-based intervention studies have been reported both at worksites and schoolsites with promising results (Glanz, 1988).

There are no nursing-based intervention strategies reported which are aimed at the military population, particularly retired and dependent military members. Efficacious intervention programs could potentially decrease that population's risk and ultimately ease an already overburdened tax-supported health care system.

Statement of the Purpose

The researcher examined the effect of a coronary artery risk evaluation program (C.A.R.E.) on the participant's health outcomes, specifically the serum cholesterol, LDL, and HDL measurements and their calculated cardiovascular level of risk. The short term effects of this intervention were examined through the interpretation of the subject's lipid status and calculated cardiovascular risk levels, pre and post participation in the C.A.R.E. program. Data were obtained from the medical records of those subjects who had participated in the "Coronary Artery Risk Evaluation" program. The "C.A.R.E." program was conducted in the outpatient primary care clinic of a 150 bed military hospital in north central Texas. The subjects were adult, English speaking, active duty, and retired military members and/or their families (dependents).

CHAPTER II

REVIEW OF LITERATURE

A large volume of literature exists in the areas of coronary artery disease (CAD), cardiovascular risk factors, and cardiovascular intervention strategies. A thorough review of this literature inclusive of theory, quantitative and qualitative studies, and editorials was conducted. From this literature, excerpts will be related that best depict the current knowledge base for this study.

Coronary Artery Disease

The outcomes of cardiovascular disease, whether organ specific or systemic, are illness, disability, and/or death (Castelli, Garrison, & Wilson, 1986). Cardiovascular disease affects some point or points in the arterial-venous network throughout the body. Results of cardiovascular disease may manifest as hypertension, poor circulation to the legs (e.g. claudication or edema), or organ failure due to insufficient circulation (e.g myocardial infarction, strokes or kidney failure). When the disease is detected within the heart musculature, it is referred to as either coronary heart disease (CHD) or more specifically coronary artery disease (CAD). This review focuses on the pathological relationship between CAD, serum lipids, atherosclerosis and myocardial infarction.

Serum Lipids

The basic function and metabolism of cholesterol and lipoproteins are reviewed before their effect on the incidence of CAD is discussed.

The term lipids refers to fats, which are insoluble in water (Guyton, 1986). Basically there are three types of lipids (or fats) that circulate in the blood. The most common type, triglycerides, make up 95% of the total plasma lipid content and the remaining 5% is comprised of sterols (cholesterol) and phospholipids (Brannon, Geyer, & Foley, 1988).

Sadler (1987) offers a concise presentation of terms. Cholesterol is found in all living cells with the highest concentration found in the white matter of the brain, myelin sheaths of nerves, and the liver where it is catabolized and excreted. It also functions as a precursor of bile acids, steroid sex hormones, adrenal cortical hormones and vitamin D. It is found in dietary animal fats and also produced in the body by the liver. Neither cholesterol nor any other lipid occurs in the blood in a free state but is linked with protein for transport.

Lipoproteins are the principle vehicles of blood lipids and are classified into 4 categories: (1) chylomicrons (found in the intestinal wall); (2) very low density or VLDL (produced in the liver and carries most of the blood triglyceride); (3) low density lipoprotein or LDL (probably a remnant of VLDL and carries the majority of the circulating cholesterol) and (4) high density lipoprotein or HDL (linked to approximately 25% of the serum cholesterol). HDL is thought to facilitate removal of cholesterol from the body (Sadler, 1987).

Triglyceride is a neutral fat and simple lipid that is a highly concentrated store of potential energy. When this molecule is metabolized by the energy cells, it combines with more oxygen and

releases more energy than carbohydrates or amino acids. It is postulated that triglycerides might work at the cellular level to "dump" cholesterol into the vessel walls and start the atherosclerosis process. Damage to cell walls opens the pathway for "foam cells" (modified white blood cells that are crammed with fat) to line the area of damage (Criqui, 1988, p. 3). It has been shown that increased levels of some, but not all, plasma lipoproteins are major factors in the pathogenesis of coronary atherosclerosis (Brewer, 1989).

Atherosclerosis

"Atherosclerosis is conceptually defined as the result of a multiplicity of interactive cascades among injurious stimuli and the healing responses of the arterial wall, occurring concurrently within a hyperlipidemic environment" (Schwartz, et al., 1989, p. 23). Atherosclerosis is a slowly evolving process characterized by lipid deposits primarily in the intimal layer of arteries (Guyton, 1986). It usually begins in childhood and manifests itself clinically in the middle adult and older years. An accumulation of lipids, especially cholesterol-rich lipoproteins, occurs in the intima and inner medial layers of the arteries. Atheromas, or atherosclerotic plaques, develop and are composed of lipids, calcium, fibrous tissue, collagen, cellular debris and blood products (Ford, 1978). As these substances accumulate and form a plaque, the blood vessel lumen progressively narrows and disrupts smooth blood flow, thus precipitating thrombus formation. Accompanying

degenerative changes also occur in the arterial wall that impair the vessel's ability to dilate. Because of these atherosclerotic changes, blood flow to the affected organs is compromised, and ischemia or infarction may result. This process can result in a heart attack or stroke.

Coronary atherosclerosis is the most common cause of CAD (Toth, 1984). Atherosclerosis may result in the following disruptions of coronary blood flow: mechanical disruptions as a result of plaque formation, which may gradually decrease blood flow, thereby causing ischemia to myocardial tissue; blood clot formation around plaques, which may result from narrowed lumen of the vessel; hemorrhage within the degenerative vessel walls under plaques; and impaired vasodilation capacity of sclerotic vessels. The manifestations of CAD are usually not evident until atherosclerosis is well advanced (Guido & Mocogni, 1989).

Myocardial Infarction

A disease manifestation of coronary artery disease is infarction. Myocardial infarction results from an inadequate blood supply to the myocardial tissue, and an ultimate loss of pumping efficiency. Normally, the heart functions in an aerobic state. Compared with all other organs in the body, the heart extracts the greatest percentage of oxygen from it's blood supply. Anaerobic metabolism is almost nonexistent, and the heart has virtually no oxygen reserves. Therefore, the myocardium is extremely sensitive to ischemia (Guyton, 1986).

Myocardial ischemia results from an imbalance between oxygen supply and demand. The predominant factor causing ischemia is decreased myocardial blood flow, which can be due to the atherosclerotic process, vasospasm, platelet aggregation, or thrombosis (Waller, 1988). Reduced myocardial perfusion lowers the oxygen tension shifting metabolism from an aerobic to an anaerobic process, which in turn causes a depletion of high energy phosphates (Guyton, 1986).

Myocardial necrosis is indicative of irreversible cell injury from sustained myocardial ischemia. The heart's ability to meet energy requirements and the accumulation of metabolic wastes alter the permeability of the cell membrane. The necrotic cells leak cytoplasmic contents and subsequently become permanently nonfunctional (Waller, 1988).

Risk Factors

"Although the concept of disease prevention is not new, the terms 'risk factor' and 'risk factor reduction' did not appear until the late 1950's and early 1960's, when they were associated with an increased probability of disease" (Cunningham, LaRosa, Hill & Becker, 1988). Risk factors were identified by applying advanced statistical methods and computer technology to data from large population-based epidemiological studies. These studies identified certain characteristics (risk factors) associated with poor cardiovascular health. The serum lipids and nonlipid risk risk factors are presented.

Serum Lipids as Risk Factors

The total serum cholesterol, LDL, HDL, and triglycerides were examined as independent risk factors for CAD. In 1971 a landmark study was conducted by Kanneli, Castelli and Gordon known as the Framingham study. This study provided the first strong epidemiological link between cholesterol, lipoproteins and CAD. This study traced 2,282 men and 2,845 women over 14 years. Sample mortality was less than 2%. Results of this study indicated that total serum cholesterol was the single best estimator of CAD in men. The study also demonstrated that people with elevated LDL cholesterol were more at risk than people with low levels of LDL. Also, people with normal total cholesterol and low HDL are far more prone to cardiovascular disease than those with normal total cholesterol and high HDL. This study was strong in several areas. The first is that it included men and women between the ages of 30 to 62 and the sample size appeared to be adequate. Strict blood level measurements were conducted. Data from offspring studies are still being collected. This landmark study was cited frequently in the literature as the basis for continuing research in this area.

Another landmark study was the Lipid Research Clinic's Coronary Prevention Trials I and II (1984). This study was a randomized, double blind study of 3,806 hypercholesterolemic men without CAD symptoms at the time of the study entry (Lipid Research Clinics Program, 1984). The hypothesis was that lowering (LDL) cholesterol levels would decrease the incidence of definite myocardial and CAD

death. All participants followed a diet of 400 mg cholesterol and 38% fat per day. The treatment group also received cholestyramine. An 8.5% reduction in LDL cholesterol was associated with a 19% reduction in CAD risk, which led to the conclusion that for every 1% reduction in blood cholesterol, CAD risk is reduced by 2%. A major drawback from these trials is that it assumed that the placebo group followed a low cholesterol diet and was able to achieve a 5% to 8% reduction in cholesterol through diet alone. The effect of the diet group could not be determined without a control group on an unmodified diet. Although the results of the drug therapy group were dramatic, the dietary effects are somewhat speculative. Also, the study focused on men only which limits generalizability to the total population. Nevertheless, this was the first experimental study on cholesterol in relation to CAD (most studies until this point were descriptive and epidemiological in nature) and is frequently referenced in the scientific literature (Lipid Research Clinics Program, 1984).

Three quasi-experimental studies offer important information regarding altering rates of coronary atherosclerosis (Schwartz, et al., 1989). The National Heart, Lung and Blood Institutes' (NHLBI) Type II Coronary Intervention Study (Levy, et al., 1984) showed that the progression of atherosclerotic plaque formation could be slowed significantly in hypercholesterolemic CAD patients who were treated with cholestyramine and lipid lowering diets. This study examined 116 patients who had greater than 50% coronary artery stenosis at baseline. Treatment with diet and cholestryamine resulted in a

significant decrease in lesion progression in 33% and 12% respectively (P= 0.02). When the patient's arteriograms were examined independently of treatment, a significant association was seen with LDL reduction, HDL elevation, and extent of coronary atherosclerosis progression (p= 0.05). The strength of this study was in the actual angiographic measurements of the coronary arteries before and after treatment.

Two other clinical trials lend support to these findings. The investigation conducted by Duffield, et al. (1983) was the first arteriographic trial to assess change in femoral artery atherosclerosis. In this study, 24 patients with peripheral vascular disease were randomly assigned to a usual care group or to the intervention group (treatment included diet, cholestryamine, and clofibrate for 19 months). In the intervention group, LDL cholesterol and triglyceride levels were 34% and 37% lower, respectively, than in the usual care group. The investigators concluded that hypolipidemic treatment resulted in a 60% reduction of the rate of femoral artery atherosclerosis progression. This study had two limitations. The first is a relatively small sample size. The second limitation is that it assumed that femoral artery atherosclerosis progression compares similarly to coronary artery atherosclerosis.

The Cholesterol Lowering Atherosclerosis Study (Blankenhorn, Nessim, Johnson, San Marco, Azen, & Cashen-Hemphill, 1987) involved 162 post-coronary bypass patients randomly assigned to placebo or combination treatment with colestipol and niacin. The average number of lesions that progressed was significantly fewer in the drug

treatment group after 2 years of therapy (p= 0.03). Fewer had new atheroma formation in native coronary arteries (p= 0.03), and adverse changes in bypass grafts were significantly less (p= 0.03). Atherosclerosis regression was reported to have occurred in 16.2% of the treated patients compared with 2.4% of the placebo/control group (p greater than 0.002). Pharmacologic therapy resulted in a 43% reduction in LDL cholesterol, a 22% reduction in triglycerides, and a 37% increase in HDL cholesterol. These studies offer a logical, precise measurement of the benefits derived from blood cholesterol lowering therapy. They were the first to show clear evidence of a treatment effect on human atherosclerotic lesions. In addition, these studies support the hypothesis that LDL cholesterol lowering can delay progression and even reduce atherosclerotic plaque in patients with known CAD (Schwartz, et al., 1989).

Theoretically, reduction of the lipid subfraction, LDL, cholesterol, is critical due to the fact that LDL's are now recognized as highly atherogenic lipoproteins. They carry large amounts (60 to 70%) of cholesterol and can easily penetrate the arterial wall (Gwynne, 1988). LDL values considered desirable are at less than 130 mg/dl; borderline high risk is seen at 130-159; and high risk at 160 mg/dl or greater (Expert Panel, 1988). In people with hypercholesterolemia, some may have isolated elevations of LDL cholesterol, while others may have elevations of both LDL cholesterol and triglycerides.

High density lipoproteins (HDL) contain approximately 50%

protein and smaller amounts of lipids. HDL's are believed to play a role in reverse cholesterol transport, that is, the transport of cholesterol from the peripheral tissues to the liver for degradation and excretion. In this way, HDL's are considered to play a role in the prevention of atherosclerosis (Gwynne, 1989).

The plasma HDL cholesterol level is inversely related to CAD risk; and LDL to HDL ratios are nc advised because each lipoprotein value is an independent risk factor (Brewer, 1989, p. 3). Separate measurement of HDL independent of LDL should be accomplished. Low HDL levels are considered a risk factor, independent of the LDL value and should stand alone in evaluating the risk status of an individual. Some investigators have suggested that the modest intake of alcohol might raise HDL levels. However, the major effect of alcohol is on HDL-3 and not HDL-2, the lipoprotein subfraction that appears to be adversely related to atherosclerosis. Alcohol use is not recommended as it may in some alcohol sensitive people dramatically raise their triglyceride levels (Brewer, 1989).

In a descriptive study by Pocock, Shaper and Phillips (1989), concentrations of HDL cholesterol, triglycerides, and total cholesterol findings were compared to the incidence of ischemic heart disease. The sample size was 7735 and the subjects were studied over a period of 7 years. During an average of 7.5 years of follow-up, 443 of the 7735 men screened developed ischemic heart disease. These men had significantly higher mean concentrations of total cholesterol ($t= 8.81$, $p= 0.001$) and triglycerides ($t= 3.78$, $p= 0.0001$), and a significantly

lower mean concentration of HDL cholesterol (t= -5.62, p= 0.03) than in men who did not develop ischemic heart disease. An analysis of covariance showed how the mean differences between men who experienced a major ischemic heart disease event during follow-up, that is men who became cases, and other men were affected by adjustment for one another and for other cardiovascular risk factors. HDL cholesterol (-0.060, p= 0.0001) and total cholesterol (0.461, p= 0.0001) both demonstrated significance. The results supported the negative relationship of HDL to a lower incidence of CAD. That is, the higher the HDL (over 35 mg/dl) the lower the risk of ischemic heart disease. This relationship is secondary only to the overall relationship of total serum cholesterol in predicting the incidence of CAD. The sample appeared to be sufficient, but only middle-aged men were studied, differing age groups and women were excluded from the study.

This study also showed that triglyceride concentrations had important associations with concentrations of total cholesterol (r= 0.37, p= 0.001) and HDL (r= -0.46, p= 0.001) in men who experienced ischemic heart disease. These findings indicate that triglyceride levels have a significant correlation to total cholesterol, HDL cholesterol and the presence of CAD (Pocock, Shaper, & Phillips, 1989).

Nonlipid Risk Factors

The presence or absence of nonlipid risk factors directs therapeutic intervention for the management of LDL cholesterol and also establishes overall risk status for CAD (Expert Panel, 1988). These nonlipid risk factors include a family history of heart disease,

diabetes mellitus, elevations in blood pressure, cigarette smoking, a sedentary lifestyle, male gender, and age (Kannel, McGee, & Gordon, 1976). Data from the Framingham Study has demonstrated definite correlations between these individual risk factors to the incidence of CAD mortality in 5,209 men and women over an 18 year period. Men were noted to have 3 to 4 times the incidence of CAD than women, establishing the male gender as a definite risk factor. Age was also positively related to the incidence of CAD.

The Pooling Project Research Group (1978) identified exercise as a critical component in the prevention of CAD. Because sedentary lifestyles are common, the prevalence of people at risk for CAD because of inactivity (60%) is much higher than for hypertension (36% for blood pressure greater than 140/90 mmHg), high serum cholesterol (40% for cholesterol levels greater than 200 mg/dl, or cigarette smoking (30% for all smokers). Sedentary lifestyle is generally defined as the absence of any consistent form of exercise such as walking, at least 20-30 minutes 3 to 4 times a week (Brannon, Geyer, & Foley, 1988). Physical activity can reduce the incidence of CAD by retarding the atherosclerotic process, modifying the structure of the coronary arteries, reducing vasospasm, enhancing electrical stability or increasing fibrinolysis. Exercise also improves glucose tolerance and insulin sensitivity, and enhances intravenous fat clearance, that retards the atherogenic process. It also improves the caliber of epicardial coronary arteries and enhances coronary collateral development. Exercise is thought to raise the HDL level

which in turn, reduces the atherosclerotic process (Powell, Thompson, Caspersen, & Kendrick, 1987).

Two studies indicate significant correlations between activity and incidence of CAD (Powell, Thompson, Caspersen, & Kendrick, 1987). The first was the Washington, DC, postal workers study which compared letter carriers' incidence of heart disease to postal clerks (Kahn, 1963). This study reported findings gathered over a 20 year period on 2240 postal workers. It compared the incidence of CAD between postal clerks (sedentary job description) and letter carriers (more active job description). The CAD mortality risk for those in sedentary work was reported as 1.4 to 1.9 times the risk of those who are more active in their jobs. This study has two major weaknesses. The first is that it measured activity indirectly, by job inferences. The second is that it measured activity subjectively by self-report.

A more recent study measured the physiological effects of activity on cardiovascular health (Peters, Cady, Bischoff, Bernstein, & Pike, 1983). Physical work capacity (PWC), a measure of physical fitness, was assessed by bicycle ergometry on 2,779 healthy men age 35-54 years. The subjects were subsequently followed for an average of 4.8 years for symptomatic myocardial infarction (MI) with 36 experiencing MIs. The relative risk of MI for below median PWC, adjusted for conventional risk factors for heart disease, was 2.2 (95% confidence limits, 1.1 and 4.7). This increased risk appeared to be limited to men with certain other risk factors present

simultaneously; above-median cholesterol level, smoking, above median systolic BP, or a combination of these. Among men with at least two of these factors, the adjusted relative risk for below median PWC was 6.6 (95% confidence limits, 2.3 and 27.8). The conclusion from this study was that poor physical fitness may be an important risk factor for heart disease, especially when conventional risk factors are also present. The physiological measures of this study are more objective than self-report and therefore is a strength of the study. A weakness of this study is that it excluded women and had a limited age group (35-54 years) and may not be generalizable to the population at large. "The repeated observation in these and other studies in various settings and populations is evidence that physical inactivity is a component cause of CAD" (Powell, Thompson, Caspersen, & Kendrick, 1987, p. 278).

Smoking was linked to CAD in the Framingham Study (Kannel, McGee, & Gordon, 1976). It was also demonstrated in the Pooling Project (1978) where men aged 40-59 who smoked more than 20 cigarettes a day had a 2.5 times the risk of a coronary event than nonsmoking men of the same age. Similarly, women in the Nurses' Health Study who smoked 25 or more cigarettes a day had 5.5 times the risk of fatal CAD, 5.8 times the risk of nonfatal CAD, and 2.6 times the risk of angina pectoris compared to nonsmokers (Myers, et al., 1987). This study followed the smoking behavior of 91,651 married female nurses, aged 35-55 years in 1976. Of this group, 34.4% were current smokers; 23% were ex-smokers; and 42.2% had

never smoked. The nurses were female and married, which may limit generalizability beyond that population.

In the study by Pocock, Shaper, & Phillips (1989), cigarette smoking was associated with a significant decrease in HDL cholesterol concentration. Men who smoked 20 or more cigarettes a day had a mean concentration of 1.12 mmol/l whereas men who had never smoked had a mean concentration of 1.18 mmol/l. Although age, male gender, and family history cannot be changed most factors can be modified to reduce risk. Stamler and Liu (1984) have indicated that based on prospective studies in the United States, it can be inferred that more than two-thirds of all coronary deaths in the prime of life are preventable.

Current Classifications of Coronary Artery Disease Risk

Following the report of the Lipid Research Clinic's Coronary Prevention Trials I and II (1984), the National Institutes of Health (NIH) sponsored a Consensus Development Conference, which produced guidelines for the identification and treatment of high cholesterol (NIH, 1985). At this conference, an expert panel of scientists examined the relationship of blood cholesterol to CAD, then set target blood cholesterol levels of 200 mg/dl or less in adults over age 30. To accomplish this goal, several strategies were recommended including: (1) develop programs to alert all adults to know their cholesterol level; (2) develop a cholesterol program for health professionals and the general public; and (3) increase the availability of foods consistent with the

recommended diet in groceries, restaurants, and cafeterias. This conference initiated the National Cholesterol Education Program (NCEP) through the National Heart, Lung and Blood Institute (subgroup of the NIH). The goals of the NCEP include promoting awareness of cholesterol and dietary changes in the general public, as well as, a movement toward lowering thresholds at which physicians recommend dietary and treatment therapy in accordance with the consensus guidelines (NIH, 1985). The NCEP is administered through the National Cholesterol Education Program Coordinating Committee. This committee serves as a nationwide network of health professionals and educators who have wide access to the American public. The coordinating committee is composed of key nonprofit national organizations and several federal agencies with interests related to blood cholesterol. Nursing is represented by the American Nurse's Association, the American Association of Occupational Health Nurse's and the National Black Nurse's Association (Watson, 1988).

CAD risk is classified according to total cholesterol and lipoprotein levels, as well as, presence of other risk factors. The NCEP classifies three levels of cardiovascular risk: low, moderate, and high. The following information is a summary of the NCEP and the American Heart Association guidelines and current studies. Initial classification of cholesterol-related CAD risk is based on the measurement of total serum cholesterol levels. Diagnosis of hypercholesterolemia is made through serum measurements of lipid levels, and are expressed in milligrams per deciliter. Fingerstick

measurements are currently under investigation and reliability is not assured at this point (Expert Panel, 1988).

Three categories are currently used for adults aged 20 years and older to describe the risk of CAD associated with total cholesterol levels (Expert Panel, 1988). Total cholesterol levels of less than 200 mg/dl are classified as desirable, levels of 200 to 239 mg/dl are classified as borderline high, and levels of greater than 240 mg/dl are classified as high.

In adults with cholesterol levels in the desirable range, efforts should be made to maintain desirable levels. Persons with initial findings of less than 200 mg/dl should be given dietary and risk factor reduction information. Follow-up measurement is recommended every 5 years (NCEP, 1985).

For persons with cholesterol levels of 200 to 239 mg/dl in the absence of CAD or two other CAD risk factors, annual measurements are recommended; a lipoprotein profile is optional. These individuals should have dietary counseling for healthy eating utilizing the "step one" guidelines (Expert Panel, 1988).

For persons with total cholesterol greater than 240 mg/dl in the presence of definite CAD or two other CAD risk factors, lipoprotein analysis (LDL, HDL, and triglyceride values) is definitely required. Other risk factors include: male gender, family history of early CAD, HDL cholesterol under 35 mg/dl on a previous test, body weight at least 30% above normal, cigarette smoking, diabetes mellitus, cerebrovascular or peripheral-vascular disease, and hypertension (NCEP, 1985).

Classification of risk is then based on LDL values. LDL values of less than 130 mg/dl are classified as desirable, values of 130 to 159 mg/dl are borderline high risk, and values greater than 160 mg/dl are classified as high risk. Dietary counseling is mandatory at this stage; either a "step one" (less than 300 mg cholesterol/day) or a "step two" diet (less than 200 mg per day) may be indicated (Expert Panel, 1988).

HDL levels may also be used to classify CAD risk. High levels of HDL can serve as a protective factor against CAD, whereas low levels (35 mg/dl or less) are associated with increased risk of CAD (Grundy, 1986). The negative correlation between elevated HDL levels and atherogenesis is as strong as the positive correlation between elevated LDL levels and atherogenesis. Potential causes of low HDL levels include cigarette smoking, obesity, lack of exercise, androgenic and related steroids, beta-blockers, glucose intolerance, hypertriglyceridemia, and genetic factors (Grundy, 1986).

Elevated triglycerides are not an independent risk factor for CAD. However, many persons with elevated triglyceride levels also have low HDL or high LDL levels which are risk factors for CAD. The National Institutes of Health (1985) classifies triglyercide levels of 250 to 500 mg/dl as hypertriglyceridemia.

A study was conducted by Wilson, Christianson, Anderson and Karnel (1989) which investigated the potential impact of the NCEP's guidelines for cholesterol risk factor screening on health care resources. The NCEP's guidelines were applied to 792 men and 853

women aged 30 to 69 years who participated in Framingham Offspring Study Examination Number Three from 1943 to 1987. Using the NCEP's algorithms, cholesterol levels were found to be desirable in 50% of men and women in this group, borderline in 12% of men and 30% of women, and elevated in 35% of men and 19% of women. The potential effect of lowering LDL cholesterol levels with diet were gauged by taking individuals in the immediate referral category from the NCEP's guidelines and estimating the proportion that would be directed toward lipid lowering medication after diet intervention. Assuming that diet reduces LDL cholesterol levels 20%, 10% or 5%, rates of medication use are projected as 2%, 5%, or 10% respectively for this group. Applying 6 year estimates of coronary risk derived from the original Framingham cohort to their offspring, the nationally recommended algorithm lacks specificity in women younger than 40 years and in both men and women older than 60 years. The study does suggest that effective diet probably will be the cornerstone of current therapy. This study was weak in that it used historical groups which might over or under estimate the eventual coronary events of the subjects. It concluded that the NCEP guidelines were effective for predicting coronary disease risk for the 40-60 year age group for a 6 year period.

Cardiovascular Intervention Strategies

The 20th century has witnessed the emergence of prevention as a significant contributor within both public and private sector health programs. Research and educational endeavors continue to

focus on disease prevention and health promotion efforts to identify the most effective means for reducing the prevalence of heart disease as well as alleviating the human and economic costs of this problem. Several clinical trials utilizing diet and drug therapies to reduce serum cholesterol levels have been conducted. Health education intervention programs have also been implemented to reduce the individual's risk for cardiovascular disease. A discussion of intervention study results is provided.

Diet Studies

A study by Bausell and Pruitt (1986) was undertaken to determine the extent to which the American public is currently informed of which foods that are high and low in cholesterol, the extent to which the public tries to avoid these foods, and the frequency they have their serum cholesterol levels monitored. A random sample of 1250 subjects was obtained, which closely resembles the national population statistics with respect to major demographic characteristics such as age and gender. A survey was conducted using an 8 item questionnaire. The results of the survey indicated that only 43% of the sample reported trying very hard to limit their cholesterol consumption and only 30% both try and know enough about cholesterol to make efforts succeed. Of the sample, only 39% failed to identify the cholesterol content of over half the food types surveyed; 68% stated they have had their cholesterol levels checked at least once within a 5 year period.

The data obtained could have limitations that are inherent in all self-reports. Despite this limitation, the high level of

response and the randomness of the sampling procedure tends to increase the validity of the design. In all, this study lends credence to the fact that despite media efforts, a large segment of the population requires some educational guidance in regards to cholesterol and it's impact on health.

The most complex intervention study was the Multiple Risk Factor Intervention Trial (1982). This randomized clinical trial compared Special Intervention Group (SI) with a Usual Care Group (UC) that included monitoring interventions for three CAD risk factors: smoking, hypertension and cholesterol. There were 12,866 men aged 35-57 in the study. The setting was outpatient health care clinics where a nutritionist was the primary educator (the overall team included an MD, nurse, health counselors, and behavioral scientists). The intervention consisted of 10 group sessions (including individual counseling) with new materials and approaches introduced in later years. The results included an average 7.5% reduction in cholesterol over 6 years (most changes were achieved in 1 year and maintained for 6 years). Weaknesses of the study were: the participants were males only and individuals under age 35 or over age 57 were not studied. Even though a significant reduction of cholesterol was achieved by the SI group, the UC group also achieved reduction in cholesterol levels. This could be attributed to the public and media educational effects on the UC group, that could not be controlled by the researchers.

A group at the Diet Modification Clinics at Baylor College of

Medicine demonstrated that a behavioral program plus nutrition education was effective in reducing cholesterol levels in participants who were not clearly identified as "at risk" for CAD (Foreyt, Scott, Mitchell, & Gotto, 1979). Participants reduced their initial cholesterol levels by 8.5% in 6 months, maintaining a 3% decrease at a 1 year follow-up. The effect of the dietary regimen and the behavior modification techniques could not be separated from each other, but the overall effect showed promise in that behavioral change in regard to dietary intake can produce significant reductions in serum cholesterol levels.

In the Cholesterol Lowering Atherosclerosis Study (1987), diet and drug therapy groups were compared to control groups (which received diet alone). Even though the drug group had greater reductions in serum lipid levels, the diet group had small but statistically significant (p=.001) reductions in lipid values: total cholesterol was reduced by 4%; triglycerides were reduced by 5%; LDL cholesterol was reduced by 5%; and HDL cholesterol was increased by 2%. These reductions were further reflected in decreased progression of coronary artery plaque formation as evidenced by arteriographic measurements post diet therapy.

Drug Studies

The Helsinki Heart Study, conducted at the Helsinki University, Finland, was a 5 year, double blind, randomized trial, which evaluated the effect of the fibric acid derivative, gemfibrizol, on

CAD events in healthy, middle-aged men with elevated LDL, VLDL or both (Frick, et al., 1987). The findings reported an 8% reduction in total and LDL cholesterol, a 35% decrease in triglycerides and a greater than 10% increase in HDL cholesterol. Nonfatal myocardial infarctions were reduced by 37% and CAD mortality by 26%. The sample consisted of two groups of middle aged men, the treatment group (2051 subjects) and the placebo group (2030 subjects). Limitations of these and any other drug study is that the long range effects (and side effects) of treatment is not readily known and can only be estimated. Again, the study excluded differing age groups and women.

Health Education

Health education is defined as any combination of learning experiences designed to facilitate voluntary adaptation of behaviors conducive to health (Green & Johnson, 1983). Health education seeks to encourage or positively influence the adoption of health-enhancing behaviors, thereby increasing the health status and quality of life for individuals. They also state "whether a health education program is operating at a primary (hygiene), secondary (early detection) or tertiary (therapeutic) stage of intervention, it may be accurately seen as an intervention" (p. 11).

Cardiovascular (CV) health education has assumed a prominent role in the United States. This is demonstrated in a report from the National Center for Health Education which provides a summary of several CV health education and intervention projects (Bauer, 1980).

A synthesis by Stone, Perry, & Leupker (1989) delineates 10 CV youth intervention studies currently funded through the National Heart, Lung and Blood Institute (NHLBI).

Studies of specific cholesterol reduction strategies were reviewed. These include health agency, worksite, community, and schoolsite intervention programs. The studies reviewed met the following criteria: (1) subjects were adults (with the exception of a schoolsite pilot study) with identified risk due to elevated cholesterol levels; (2) subjects were outpatient and had not experienced prior myocardial infarctions; (3) a clearly defined health/nutrition education component was described; and (4) outcomes were reported in terms of changes in cholesterol levels.

A health agency intervention was conducted at the Memorial Hospital in Pawtucket, Rhode Island (Peterson, Lefebvre, & Ferreira, 1986). This non-randomized trial screened 329 hospital employees for elevated cholesterol and assessment of risk factors. Multiple strategies of screening, counseling, and referral events were used. Subjects participated in health education classes and follow-up cholesterol screenings. Of those screened, 59% had elevated cholesterol levels and 44% of this group were remeasured in six months. There was an average cholesterol reduction of 10.9% or 26 mg/dl per returning participant. Education appeared to have effect on the health outcome of decreased cholesterol. However, a weakness in the study is that it used various education strategies. The total percentage of cholesterol reduction was not directly

correlated to a particular method of instruction.

Worksite intervention programs are increasing rapidly; three worksite intervention studies were examined. A study at the Social Security Administration demonstrated the feasibility of providing lipid clinics at the worksite (Luepker, et al., 1978). The sample included 146 hypercholesterolemic employees, aged 20-50, who were randomly placed into one of four treatment groups. The first treatment group (A) received treatment strictly at the clinic which included, diet, then diet plus drugs. The second group (B) worked with the clinic lipid nutritionist in cooperation with the worker's private physician. The third group (C) had a referral to a private physician; and the fourth group (D) had no intervention. The first group had a 12% decrease in cholesterol, the second group had a 15% decrease, the third group had 17% decrease and the fourth group (control) had a 4% decrease (p 0.001). It was expected that the first two groups would do better, since they received considerable face to face instruction and free medication. The fact that group C had the best results was an unanticipated finding. The authors speculated that the reason the response in group C was higher than groups A and B (even though the interventions were essentially the same) was due to the extensive efforts made by the clinic secretary and staff physician. Group C treatment was successful in that 32 of the 34 screened people had physician office visits and received diet instructions. Repeated visits to the clinic for venipuncture and re-evaluation of their lipid values probably reinforced cholesterol

lowering diet changes. The study did, however, indicate the feasibility and potential success of ongoing cholesterol screening and referral programs at the worksite.

A trial at the New York Telephone Company involved screening, and group nutrition and physical activity classes for an eight week period (Bruno, Arnold, Jacobson, Winick, & Wynder, 1983). The sample consisted of 97 employees who were randomly assigned to treatment and control groups. The treatment group reported a greater decrease (8.8%) in serum cholesterol levels than the control group (2.4%), as well as, significantly greater weight loss.

The L.L. Bean worksite study was also examined (Quigley, 1986). This nonrandomized trial used group education and follow-up screenings as the primary strategy for cholesterol reduction. This company screened 472 employees (154 or 33% screened had elevated cholesterol levels). Results indicate that 302 employees attended the educational program (64% of the screenees) and 70% of screenees at high risk returned after 8 months for re-screening. An average cholesterol reduction of 38 mg/dl or 14% in the re-screened group were achieved. A potential weakness of the study was that it was a nonrandom sample, subjects may be more motivated than others to comply with the instructions. The study measured only the short term effects of treatment.

A large scale community program was reviewed, the Pawtucket Heart Health program (Lefebvre, et al., 1986). This was a community wide campaign that utilized multiple strategies,

including: screening; counseling; referrals; nutrition education at the screenings; and adjunct events such as a recipe contest, newspaper columns, and physician lectures. Subjects screened were 1439 adults, of these, 853 adults (59.3%) had undesirable cholesterol levels. Results indicate that 72.3% of elevated screenees returned to the 2 month re-screen and 57.7% of these had reductions in cholesterol (10-14%). In addition, 49% of these persons had lowered their blood cholesterol levels to the point where they had moved to a lower category of risk for CAD as established by the NIH Consensus Conference. In contrast, of those participants who showed an increase in blood cholesterol level, 70% remained in their initial category or risk. This study demonstrated that population based interventions are possible and effective. The study was not designed to test specific education strategies but rather to test the effectiveness of a campaign strategy on a target population.

To assess the effectiveness of an education based, cholesterol lowering program, an interesting pilot study was conducted. This study by Resnicou, et al., (1989) was conducted at a grade school site with 150 subjects, ages 10-12. These subjects were screened and attended an annual "know your body" program; nutrition education and counseling was provided to students at that time. Of this sample, 70 (47%) had cholesterol levels greater than 170 mg/dl. Parental consent was obtained and 34 of these students attended three or more workshop sessions designed to provide intensive education and nutrition counseling. For evaluation purposes, data from the

intervention group were compared to a reference group comprised of 118 "know your body" participants from four other schools. Following the workshop, the mean cholesterol in the intervention group fell 9% from the baseline (p= 0.001). Mean cholesterol in the reference group fell 6.6% from baseline (p= 0.001). The sample was small (since it was a pilot study) and the absence of a control group ideally comprised of children who were screened but not informed of their cholesterol level and who received no intervention would facilitate interpretation of intervention impact as well as help determine the effect of regression to mean. Overall, the study had merit in that it presented a method of imparting current knowledge of hypercholesterolemia to children at high risk.

Summary

There is a wealth of knowledge concerning coronary artery disease, risk factor identification and reduction, and health teaching strategies. However, while the literature review provides building blocks for successful interventions, researchers identify the need for further educational program development and research.

The medical empirical and theoretical literature presents strong evidence of the link between elevated lipid levels and CAD. In all, the strongest studies are epidemiological in nature, but recent clinical trials involving dietary and pharmacological interventions have had strong impact. An offshoot of recent scientific knowledge has been the formation of the NCEP to inform

health professionals and the public about the importance of monitoring serum cholesterol levels. Since the definitive basis for risk factor reduction and the NCEP's guidelines for reduction have only recently been established, research regarding intervention strategies and effects on specific health outcomes is needed.

Today the relationship between diet, cholesterol and CAD is incontrovertible. The Lipid Research Clinic Coronary Prevention Trial provided clear evidence of the benefits of lowering cholesterol in terms of preventing CAD (Lipid Research Clinics Program, 1984). A 1% reduction in cholesterol was associated with a 2% reduction in risk (NIH, 1984). This includes evidence that lowering the LDL cholesterol and raising the HDL cholesterol also reduces risk of CAD. This does not negate the additive effect of all risk factors in the development of CAD; but, rather, highlights the impact that serum cholesterol has in predicting risk for CAD.

Although much of the research demonstrates strong correlations, the exact mechanism of cholesterol in the atherosclerotic plaque formation process is still under study. It will require generations of study to fully support the estimated associations between CAD and cholesterol. Moderate exercise, maintaining ideal body weight, diets low in fats and cholesterol, and nonsmoking are interventions contributory to wellness and are goals worth attaining (Cunningham, LaRosa, Hill, & Becker, 1988).

The most obvious lack in the research is the paucity of data regarding women and age groups under 20 and over 60 of both genders.

The assumption is made that cholesterol lowering will benefit all. The degree to which changes in cholesterol, after intervention programs, are sustained over time must be addressed. Coronary artery disease would not be significantly affected if cholesterol reductions are only short term. Further research is mandated in these areas.

The effectiveness of various patient education strategies and methods to promote long term compliance should be researched. The studies reviewed all demonstrated varying levels of success. These studies demonstrate that successful reduction of elevated cholesterol depends on contact with health professionals, structured counseling and/or educational programs and medical follow-up. Despite the different strategies and program goals there is still not clear evidence to address two important issues. The first is that of minimal levels of intervention necessary to achieve behavioral change and how long will changes be maintained? The second issue concerns the development and study of complementary educational efforts in clinical and community settings (Glanz, 1988). Furthermore, implementation of cardiovascular health promotion programs is not enough; evaluating the effectiveness of such endeavors to a far greater extent is needed to determine what strategies work, with what populations, and under what conditions. These needs formed the basis for this investigation.

CHAPTER III

FRAME OF REFERENCE

This chapter establishes the theoretical framework upon which this study is based. Included are definitions of concepts, relationships between the concepts, propositions, and the specific hypotheses identified for study. "The purpose of a framework is to organize the development of the study and provide a context for the interpretation of findings" (Burns & Grove, 1987, p. 178).

Theoretical Framework

The theoretical framework for this study is the Precede Model of health education (Figure 1; Green, Kreuter, Deeds & Partridge, 1980). This model is particularly well suited to a nursing based intervention program, because the assessment, planning, implementation and evaluation components correlate well with the nursing process. "The Precede framework is an orderly planning approach in dealing with specific health problems, focusing on specific objectives and behaviors, and consequently explicit health education" (Downey, Greenberg, Virgilio, & Berenson, 1989, p.36). The Precede framework renders specific insights concerning evaluation and thus provides a highly focused target for intervention. This model is considered "robust" and has been utilized as the framework for a variety of studies (Downey, Greenberg, Virgilio, & Berenson, 1989; Wang et al., 1979; Green, Levine, Walle, & Deeds, 1979).

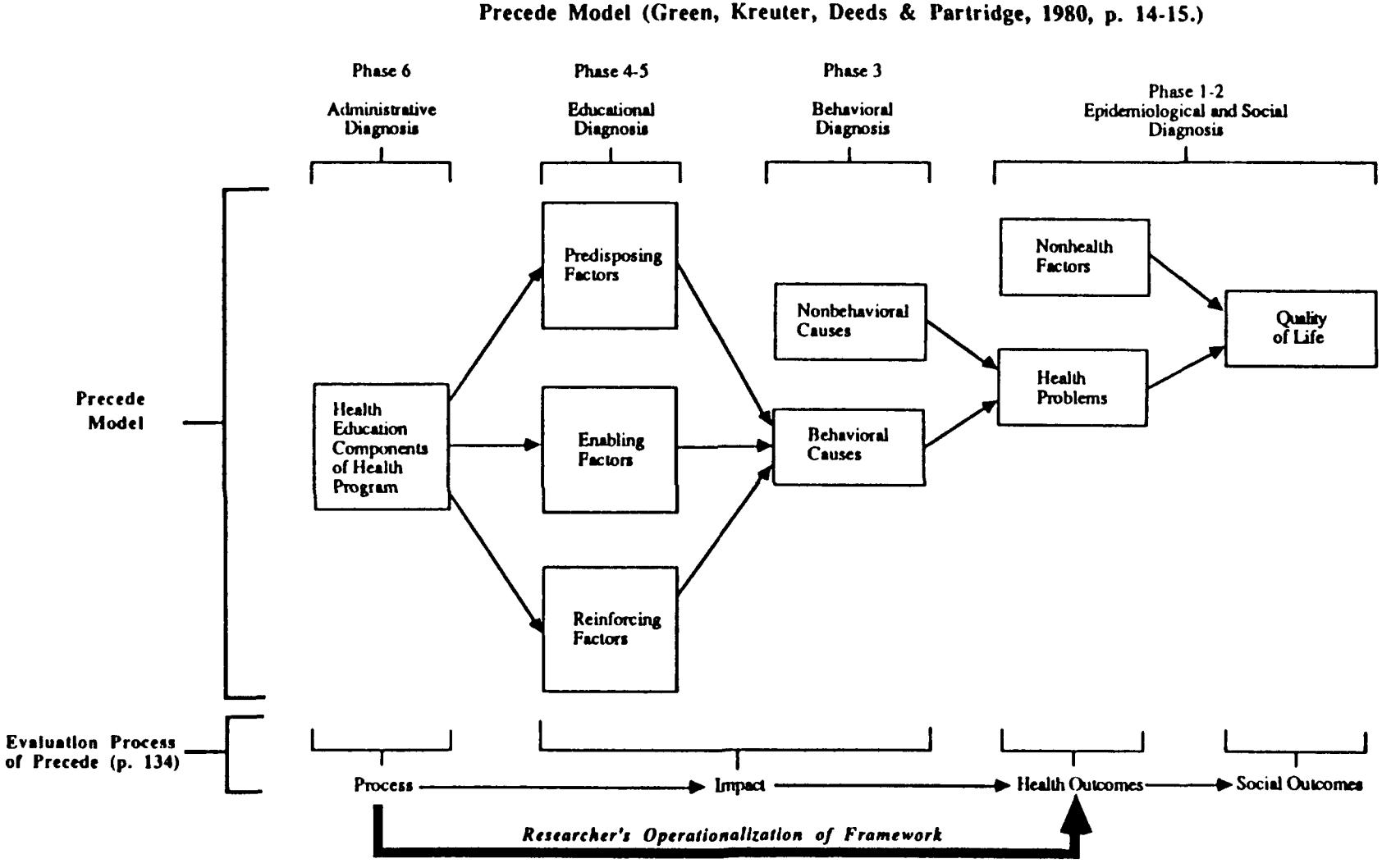


Figure 1. Theoretical Framework

"Precede" is an acronym for predisposing, reinforcing, and enabling causes in educational diagnosis and evaluation. This model evolves from two frames of utilization; the first is diagnosis and planning and the second involves the evaluation process. Normally, health educators design an intervention program first; then they anticipate the outcomes. Thus, the intervention is based on guesswork and may be ineffective. Using Precede, the educator focuses on outcomes (or final consequences) first, and then works backwards or deductively to the original causes. This is accomplished through seven phases of the framework.

Phase One considers quality of life, which is defined as the "perception of groups or individuals that their needs are being satisfied and that they are not denied opportunities to achieve happiness and fulfillment" (Green, Kreuter, Deeds & Partridge, 1980, p. xv). Quality of life is assessed by analyzing some of the general problems of specific populations. A social problem is defined as "a situation that a significant number of people believe to be a source of difficulty or unhappiness. It consists of an objective situation as well as a social interpretation" (p. xvi) which may indicate levels of quality of life.

Phase Two is involved in identifying specific health problems that contribute to the social problem identified in phase one. Specific health problems are prioritized and the health problem most deserving of scarce educational resources is selected. Non-health factors are also identified here because they may have an

indirect influence on the quality of life. Phase One and Two determine the health and the social outcomes of the program. Health outcomes are defined as "any medically or epidemiologically defined characteristic of a patient or health problem that results from health promotion or care provided or required as measured at one point in time" (Green, Kreuter, Deeds & Partridge, 1980, p. xiv). These are the measurable outcomes or goals of a health promotion program or specific health care intervention. These outcomes are identified through medical or epidemiological research and are deemed desirable in order to improve the identified health problem. Social outcomes are "valued health outcomes or improvements in quality of life that there is reasonable evidence to believe are causally related to health-care processes" (p. xiii).

Phase Three consists of identifying specific health related behaviors that appear to be linked to the health problem identified in Phase Two. Health behavior is defined as an action that has a specific frequency, duration, and purpose whether conscious or unconscious that affects an individual's health both positively or negatively (Green, Kreuter, Deeds & Partridge, 1980). They must be specific because these are the behaviors that the program is designed to effect. Health problems are also linked to nonbehavioral causes such as economic, genetic, and enviromental factors. Nonbehavioral causes have power (although indirect) to influence health. Awareness of these factors helps educators to be realistic about the limitations of their programs.

Phase Four involves educational diagnosis. It focuses on the identification of the predisposing, reinforcing, and enabling factors which have the potential to effect behavior. These factors are based on Becker's Health Belief Model (Becker, 1974). Predisposing factors are a person's attitudes, beliefs, values and perceptions which facilitate or hinder personal motivation for change. Enabling factors may be considered to be barriers to change created mainly by societal forces or systems (eg. limited facilities, inadequate personal or community resources etc.). Reinforcing factors are related to the feedback the learner receives from others; the result will have a positive or negative effect on behavioral change.

Phase Five involves deciding which of the factors identified in Phase Four are to be the focus of the intervention. The decision is based on their relative importance and the resources available to influence them. Once this decision is made then Phase Six can begin.

Phase Six is the development and implementation of a program. By following the logical progression of Phases 1-5, appropriate interventions can be identified based on availability of resources. This phase determines the intervention to be used in the program.

Phase Seven is the evaluation phase. Criteria naturally fall out of the framework during the diagnostic procedure, Phases 1-6 (Figure 1). Program and behavioral objectives are stated as the result of these phases which set up the standards for evaluation.

The evaluation phase is composed of three levels: process evaluation (the health education program), impact evaluation (predisposing, enabling, and reinforcing factors and behavior), and outcome evaluation (health and social benefits).

By working through the model, along the causal chain from right to left, it provides a systematic search for the basic health problems holding the greatest promise of yielding social or health benefits assuming that health education activities and resources can effectively change these problems. The evaluation process requires working through the model from left to right so that the intervention program is examined first and measured in terms of effects on health outcomes and social benefits. Evaluation verifies the diagnosis after the program has begun.

Health education is defined as an intervention which influences voluntary adoption of behavior conducive to health. Thus, a health education intervention is implemented to reduce negative health behavior over time (Green, Kreuter, Deeds, & Partridge, 1980). The Coronary Artery Risk Evaluation Program (C.A.R.E.) program correlates closely with the Precede model in it's development. The correlate to Phase One was identified as a general request from "line" personnel (regular Air Force) for more information about their basic state of health. This corresponds to the conceptual definition of quality of life and social problems, as a situation that a significant number of people believe to be a source of difficulty. During this phase, the effect of cardiovascular disease on the morbidity and

mortality of the military population was considered. Ways to decrease the disability and loss of productivity of military members were examined. A conference of Strategic Air Command (SAC) Commanders was held in March of 1988 to consider the social outcomes of this and other health problems. Phase Two is where specific health problems that contribute to the social problem are identified. At this conference, led by Brigadier General Anderson (SAC Surgeon General), coronary artery disease was identified as a critical health problem requiring intervention.

Phase Three involves identification of the behavioral causes of coronary artery disease. The recommendations of the Expert Panel on the Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (also known as the ATP) were accepted (Expert Panel, 1988). The ATP report assigns a risk status on the basis of the total and LDL cholesterol levels and the presence of CHD or other CHD risk factors. Therefore, the lipid profile was identified as a major causal determinant of CAD.

Phase Four and Five involve determining the predisposing, enabling, and reinforcing factors which precede the health problem. The SAC Surgeon General's office acknowledged the risk factors that were identified through research such as the results of the Lipid Research Clinics Coronary Primary Prevention Trial (1984). These risk factors (male gender, cigarette smoking, hypertension, low HDL levels, diabetes, family history of CHD, history of cerebrovascular or occlusive peripheral vascular disease, and obesity) correlate

with the predisposing factors of the Precede Model.

Phase Six involves the consideration of phases one through five in determining the educational intervention program to decrease the incidence and severity of the health problem (CAD) and it's ultimate effect on the quality of life for the military population. In March, 1988 all SAC medical facilities received a directive from the SAC Surgeon General called the "SAC Care Program." This directive was part of a new health promotion initiative to examine Air Force members' blood pressure, fasting blood sugars, and cholesterol levels. Each facility was directed to institute a program which would provide, on a voluntary basis, this information and to receive feedback and referral if necessary for those in high risk groups.

The C.A.R.E. program was developed to meet the goals of the SAC directive and to provide a means to effect positive health outcomes (reduction in cardiovascular risk status) through a screening and education intervention. This program corresponds to the "Health Education Components of Health Program" of the Precede Model.

This study focused on two components of the Precede model, the "Health Education Components of Health Program" and the "Health Problems" (Figure 1) which is indicated by the heavy black arrow. The model links: health education intervention to health and social outcomes, indicating a positive relationship. This study mirrors this link; the "Health Education Components of Health Program"

indicated in the model corresponds to the health educational program C.A.R.E. The "Health Outcomes" component of the model corresponds to the serum lipid values and risk for cardiovascular disease. The investigator examined the effect of the C.A.R.E. program (independent variable), executed by the investigator, on the serum lipid values and calculated cardiovascular risk levels (dependent variables) of retired and active duty military personnel. The purpose of the C.A.R.E. program was to identify and alter the participant's risk for cardiovascular disease. Health outcomes were operationalized as the biological measurements of serum cholesterol, HDL, LDL levels and calculated risk levels, measured six months after attending the C.A.R.E. program.

Hypotheses

From the proposition, health education is a process to reduce negative health behavior over time (Green, Kreuter, Deeds & Partridge, 1980, p. 10.), two hypotheses have evolved.

1. There is a reduction in the mean laboratory values of total serum and LDL cholesterol, and an increase in HDL cholesterol levels of military members post-participation in the C.A.R.E. program.
2. There is a decrease in cardiovascular risk levels of military members post-participation in the C.A.R.E. program.

These hypotheses could potentially support the relationship indicated in the framework by determining whether the C.A.R.E. program influences the behavior of individuals engaged in negative

behavior (moderate and high risk groups) based on physiological parameters.

Definition of Major Variables

Independent variable: The Coronary Artery Risk Evaluation (C.A.R.E.) Program.

Conceptual Definition: A health education intervention which includes specialized instruction to facilitate voluntary reduction of negative health behavior and the promotion of positive health behavior (Green, Kreuter, Deeds, & Partridge, 1980).

Operational Definition: The intervention is outlined in the following steps.

1. Serum lipid profile screening
2. Risk factor assessment (history, serum glucose testing, height, weight and blood pressure measurements).
3. Cardiovascular risk calculation.
4. Group education and instruction by the researcher.
5. Follow-up monitoring of cholesterol levels and counseling by the researcher (Appendix A).

Dependent Variable: Serum cholesterol.

Conceptual Definition: A health outcome which is defined as an essential chemical compound used by the body, that is both ingested in the diet and synthesized by the body (approximately 800 mg per day). It is a necessary component of cell membranes,

and is the precursor for bile salts and steroid hormones. Elevated cholesterol is considered to be the precursor for atherosclerosis (Schultheis, 1990).

Operational Definition: Serum laboratory measurement after a 12 hour fast.

Dependent Variable: Low density lipoprotein (LDL).

Conceptual Definition: A health outcome defined as macromolecular conglomerates of lipids (fats and cholesterol) and specific proteins. It is the transport vehicle in the blood which conveys cholesterol throughout the body. It is considered highly atherogenic because of the large amount of cholesterol (60-70% of total serum cholesterol) it carries and can easily penetrate the arterial wall (Guido & Mocogni, 1989).

Operational Definition: LDL values are not measured directly but are calculated by using other laboratory lipid values. Laboratory measurement of serum cholesterol, HDL and triglycerides are done after a 12 hour fast, then the following formula is calculated based on these values:

Total cholesterol - HDL - (triglycerides/5) = LDL (Friedewald, Levy, & Fredrickson, 1972).

Dependent Variable: High density lipoprotein (HDL).

Conceptual Definition: A health outcome which is defined as molecules containing approximately 50% protein and smaller amounts of lipids. They are believed to play a role in reverse cholesterol transport (in the blood); that is, the transport of cholesterol

from the peripheral tissues to the liver for degradation and excretion. Thus, they are considered to help reverse or retard the atherogenic process (Guido & Mocogni, 1989).

Operational Definition: Serum laboratory measurement after a 12 hour fast.

Dependent Variable: Cardiovascular risk level.

Conceptual Definition: A health outcome which is influenced by positive or negative health behaviors (Green, Kreuter, Deeds, & Partridge, 1980). It is an estimated degree of risk for cardiovascular disease based on physiological parameters and the presence of certain characteristics (Expert Panel, 1988).

Operational Definition: Assigned risk status (for cardiovascular disease) on the basis of the total cholesterol, the LDL and HDL cholesterol, and the presence of coronary heart disease (CHD) or other CHD risk factors (Expert Panel, 1988). Based on the National Cholesterol Education Program's guidelines, an individual is classified as having low risk, moderate risk, or high risk for cardiovascular disease (Appendix B).

Attribute Variables: age, gender, size (height and weight), tobacco consumption, blood sugar levels, blood pressure and heart rates.

Relevant Terms:

1. Military member: An individual who is entitled, by law, to medical benefits from any branch of military service in the United States. This includes any active duty, retired, or dependent of active duty or retired (children of active duty or retired are

considered dependents until the age of 21).

2. Lipid profile screening: A voluntary blood analysis of the total cholesterol, HDL, and triglyceride levels after a 12 hour fast.

3. Cardiovascular risk factor: Certain characteristics identified through epidemiological, experimental, clinical and interventional data that are associated with poor cardiovascular health (Schultheis, 1990). Specific risk factors are provided in Appendix C.

4. Health behavior: Health behavior is defined as an action that has a specific frequency, duration, and purpose whether conscious or unconscious that affects an individual's health both positively or negatively (Green, Kreuter, Deeds & Partridge, 1980).

5. Coronary Heart Disease (CHD): CHD is defined as angina, coronary insufficiency and myocardial infarction (Guido & Mocogni, 1989).

6. Diabetes Mellitus: Diabetes mellitus is defined as a common inherited disorder of carbohydrate metabolism caused by either an absolute lack of circulating insulin or an inability to use available endogenous insulin, leading to hyperglycemia and a variety of other metabolic, tissue, and cardiovascular effects (Groer & Shekleton, 1983).

7. Hypertension: Hypertension is defined as sustained arterial pressure. Since blood pressure varies among individuals it is difficult to define high blood pressure as a specific number of units greater than normal. Generally, individuals with a blood

pressure consistently greater than 140/90 mmHg are considered to be hypertensive (Groer & Shekleton, 1983).

Assumptions

Two underlying assumptions of the Precede model are: "health and health beliefs are caused by multiple factors" and "because health and health behavior are determined by multiple factors, health educational efforts to affect behavior must be multi-dimensional" (Green, Kreuter, Deeds, & Partridge, 1980, p. 11). Williams (1980) identified 13 commonly embedded assumptions in nursing research. Two of these assumptions are pertinent to this study: "people want to assume control of their own health problems" and "people operate on the basis of cognitive information" (p.48).

Further assumptions upon which this study will be based include: individuals can be active, self-responsible participants in their health care; and education can lead to change in behavior or health outcome of the subject.

Theoretical Limitations of the Study

A limitation of the study was that it tested the relationship of the health intervention to the health outcomes only. There are other relationships indicated in the model which are relevant but not addressed in this study. Another limitation in this model is attributed to factors identified in the framework as "nonbehavioral causes". These factors represent the genetic, economic, and environmental influences which affect health (Green, Kreuter, Deeds & Partridge, 1980). The presence

of these factors attest to the fact that health is multi-faceted. The study implemented only one intervention (education), therefore, these other health "factors" were not addressed or measured.

CHAPTER IV

METHODS AND PROCEDURES

This chapter delineates the specific research protocol for this study. Included are descriptions of the research design, the population and sample, and pertinent ethical considerations. The measurement methods and data collection process are discussed in detail. The chapter concludes with a discussion of methodological limitations.

Research Design

In order to examine the effect of the coronary artery risk evaluation program (C.A.R.E.) on the serum cholesterol and cardiovascular risk levels, a quasi-experimental design was used. Since this study was retrospective and no controls could be implemented, it precluded the use of a true experimental design. The study was based on the one group pretest-post-test design, identified by Burns and Grove (1987), as shown in Figure 2. The pre-test measurement of cardiovascular risk and serum cholesterol levels served as the control group. The study compared the measurements of the total serum cholesterol, the HDL, the LDL, and the estimated risk level (dependent variables) before and 6 months after participation in the C.A.R.E. program (independent variable). The results of this

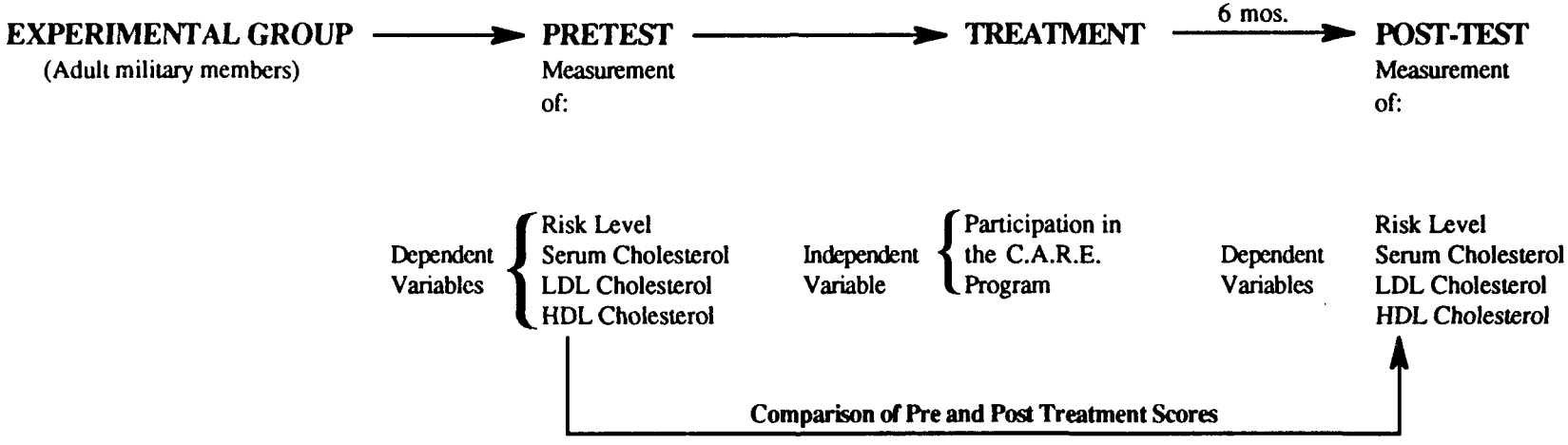


Figure 2. Study design based on one-group pretest – post-test, quasi-experimental design (Burns & Grove, 1987, p. 259).

comparison were tested for statistical differences pre- and post-treatment.

The independent or treatment variable was represented as participation in the C.A.R.E. program. This was voluntary screening, evaluation and education program offered to all eligible military members. The first step was the screening process to assess risk factors and involves two parts (Appendix D). Each subject was given instructions and a laboratory request form to have a serum lipid profile (12 hour fasting) drawn. Then each subject was interviewed (Appendix E) by the nurse and enrolled in the next available C.A.R.E. class. This interview was documented in the person's medical record.

The second step was evaluation. The person's cardiac risk status was assessed based on reported risk factors and the results of the serum lipid profile. According to NCEP's guidelines (Appendix B), the person was determined to have low, moderate, or high risk for cardiovascular disease. Recommendations were made according to this risk status and individual considerations. These recommendations (Appendices F and G) include dietary guidelines, exercise guidelines, follow-up instructions, and in some cases formal referrals to other resources. Referrals were made to the "Stop Smoking" program (offered in the mental health clinic of this facility); the registered dietician (for more detailed, specific instructions and weight control); or to the internal medicine clinic for those individuals at high risk, who also were noted to have high blood pressure, elevated blood sugars, or history of cardiovascular disease.

The educational component of the program involved voluntary attendence at the C.A.R.E. class. This 90 minute presentation provided instruction concerning cardiovascular health, emphasizing the relationship between lifestyle behaviors and identification of risk factors which determine one's risk for heart disease. At the beginning of the session each participant was given a handout which includes their: (1) serum lipid profile results; (2) assigned risk status (low, moderate, or high risk); and (3) specific individualized recommendations (Appendix G). The guidelines for the Step One diet were presented and copies given to each subject. The results of the lipid profiles and risk level evaluations were explained in detail. General lifestyle changes were recommended, such as reduction of smoking, sedentary behaviors, and body weight. A 13 minute videotape on "Lifestyles for Cardiovascular Health" (Med-Comm, 1985) was presented to reinforce the main points of the class. At the end of each session recommendations and follow-up instructions were discussed with each participant individually. Class participation and the individual counseling session were then documented in the participant's medical record (Appendix H).

In 6 months, the participants were notified by letter to have their serum lipid profiles remeasured. The follow-up results were evaluated and depending on the results, further actions/recommendations were determined. The participants were contacted by telephone and a copy of their lab results and recommendations were mailed to their home and also placed in their medical records.

This design was well suited for comparing pre-treatment and post-treatment scores. It allowed for the application of statistical measures which examined the effect of the treatment. This presents a more vivid description of the causal mechanisms of the treatment (C.A.R.E. program) than a descriptive study design would have provided. It also allowed for greater researcher control. Even though this study was retrospective in nature, the provision of the treatment was consistently applied and documented by this researcher for a period of one year. As the only provider of the treatment program, this researcher had greater control over the experimental group.

The addition of a nonequivalent control group would have enhanced the validity of the findings; however, since this was a retrospective study, this was not possible and identified as a major threat to design validity. "Pre-test scores cannot adequately serve the same function as a control group" (Burns & Grove, 1987, p. 258). Other uncontrolled internal threats to validity are identified by Burns and Grove. The first was history, events which could take place between pre- and post-measurement of the dependent variables that alter the post-measurement scores. Green and Lewis (1986) identify history as a pervasive threat and define it as "any secular trend or extraneous event occurring before or during the health education program that could account for some or all of the existing knowledge, attitudes, behavior, or health improvements measured after the program" (p. 183). Statistical regression was

identified as a second threat. This is described as movement and regression of extreme score towards the mean in studies using a pre- and post-test design. This regression increased the possibility of making incorrect conclusions about the treatment's effect on the post-test scores. Maturation was recognized as a third threat to validity, due to the immeasurable effect of growing older, wiser and more experienced during the time of the study. However, it was considered less of a threat when physiological measures were applied. The fourth threat to validity was testing. People may be cued and motivated to change their behavior quite independent of the health education intervention in order to control the risk factor(s) if they know they are going to be tested again (Green & Lewis, 1986). This posed an internal threat to validity since there was no control group in which to measure the effect of testing on the dependent variables. With a control group, this effect, along with history and maturation, could be subtracted from the total change observed in the experimental group. Instrumentation was the final threat to validity inherent in this design. This implies that problems occur when pre-tests are not applied under exactly the same circumstances as the post-test. Although the laboratory measurements of the dependent variables (total cholesterol, HDL, and LDL values) are standardized procedures, there were still uncontrolled threats to the validity of the results. The foremost threat was due to the fact that it can only be assumed that the subjects followed the dietary fast as instructed prior to specimen collection. If this

fast was not adhered to, the accuracy of the measurements could have been affected.

Sample

The population consisted of all the participants in the Coronary Artery Risk Evaluation Program (C.A.R.E.) held in the Primary Care Clinic of a 150 bed military hospital from July 1, 1988 to July 1, 1989. The total subjects who were screened and attended class that time was 483. Of this population, 15 subjects were referred immediately to the internal medicine clinic due to dangerously high lipid (serum cholesterol greater than 300 mg/dl) values and were removed from the program. People with cholesterol values less than 200 mg/dl (and the absence of other non-lipid risk factors) were considered low risk and instructed to have follow-up blood levels drawn in one year. The program ended August 1, 1989, therefore this group (n=122) was not used in the study. The group identified as having moderate to high risk for cardiovascular disease, but who failed to return for follow-up evaluation, was lost to the study (n=142). Twenty-four subjects did not meet the criteria and therefore were not included in the sample. Total attrition for this population was 142, leaving a sample of 195 for study.

This sample (n=195) met the following criteria for this study: (1) subjects are adults (greater than 16 years of age); (2) subjects must be military members (active duty, retired, or dependent); (3) subjects must not be under pharmacological treatment for hyper-

lipidemia; (4) subjects must be English speaking; (5) subjects must not have triglycerides over 400 mg/dl; (6) must not be diabetic; and (7) no current referrals to other health professionals.

The sampling technique was considered non-probability because the population was identified as all the subjects who elected to participate in the C.A.R.E. program. In this sense, it is a sample of convenience, because all subjects who met the criteria were included in the study. Since this is a retrospective study there was no attrition from this sample. Since this program was voluntary, a bias was entered because people who chose to enter this program may be different from people who chose not to. Therefore, the results of this study cannot be generalized beyond this agency and sample group. This is a major weakness of this type of sampling method. The purpose of this study was to examine the effect of the program on a specific population, by including all the subjects who participated in the program this need was addressed. For the purposes of this study, a randomized sample is not necessary. Strengths of this sampling technique included: easy access to subjects; decreased cost (treatment is applied in one setting); and a decrease in the amount of time in establishing an adequate sample.

To decrease the risk of sampling error, a power analysis was performed to determine needed sample size. The study which most closely resembled this research design was utilized (Bruno, et al., 1983). The treatment mean cholesterol (242) was subtracted from the control mean cholesterol (266) and divided by the control standard

deviation (29). The effect size was estimated as 0.82. Using the conventional standard of .8 for an alpha of 0.5 the sample size for each group would be 25 (a total of 50 subjects would be needed). Thus, the sample size (n=195) for this study was more than adequate to determine differences before and after treatment (Cohen, 1977).

Setting

The setting was the outpatient Primary Care Clinic of a 150 bed military hospital which serves active duty, retired from active duty, and dependent military members, over the age of 16 years. This hospital is located in a large metropolitan area in North Texas. The study program, C.A.R.E., was implemented and administered by this researcher, who had access to the subject's medical records and to the facility which facilitated data collection. Of considerable benefit was the presence of an established support system within the institution.

This setting was chosen on the basis of this researcher's desire to ascertain the effect that this specific program might have had on the participants. Since the data are readily available, a retrospective data collection and analysis met this need.

Ethical Considerations

There were no positive or negative effects expected for the subjects. Data were obtained by medical record review and the raw data available in the computer database, titled C.A.R.E. There was no further direct contact or interaction with the research subjects.

Only the information recorded in the data base and medical records pertinent to the C.A.R.E. program will be used. No other person was allowed access to this raw data. The Privacy Act of 1974 was strictly upheld. No identifying data (such as name and social security number) was utilized for this study. The data were coded numerically so that the information obtained cannot be traceable to any particular subject.

Consent from the Thesis Committee and the Human Rights Review Committee for the University of Texas at Arlington was obtained prior to conducting this study. Agency consent was also obtained from the agency's institutional review board in order to have access to the data which were collected on participants in the C.A.R.E. program (Appendix I). This study was considered exempt by the institutional review process, at the University of Texas at Arlington, because the research involves the collection or study of existing data, documents, and records. It was also considered exempt because the information was recorded by the investigator in such a way that subjects cannot be identified (Burns & Grove, 1987).

Measurement Methods

The dependent variables are operationalized as the physiological measurements of total serum cholesterol, HDL and LDL cholesterol (lipid profile). The cardiovascular risk level was calculated according to these values and the presence of risk factors reported by the subject and/or documented in the medical record. The National Cholesterol Education's Program's (NCEP) recent guidelines contain an

operational definition of the lipid profile. Standardized protocol for lipid data collection requires that the subject (1) fast for 12 hours, (2) maintain stable dietary patterns for at least three weeks, (3) maintain stable body weight, (4) be neither ill nor (5) pregnant, and have (6) no recent history of myocardial infarction, less than three months (Hayman, 1988).

The Laboratory Standardization Panel of the NCEP has set three major goals for improving lipid analysis in all laboratories. These goals include improving the accuracy, precision, and agreement in reporting procedures among laboratories of lipid and lipoprotein analysis.

> The NCEP defines precision, expressed as coefficient of variation (CV) (%), is a measure of variability in assay results from run to run or from day to day, regardless of how close the mean value of several determinations is to the true analytical value for an analyte. Precision is typically calculated as the standard deviation for each set of within-day or among-day tests for a given cholesterol unknown, divided by the overall mean of the data set and multiplied by 100. Accuracy is defined as the overall concordance of the mean value for an infinite number of assay results for a given analyte (estimated by linear regression over the entire calibration curve) or an expression of concordance of the mean values of a finite number of repeated determinations on reference materials with specific known "true values" (estimated by the CDC). The terms inaccuracy and

bias are used interchangeably (McManus, 1989, p. 84).

Twelve hour fasting blood samples were obtained by venipuncture using a 10 ml clot tube. Samples were centrifuged for 10 minutes at 10 degrees centigrade and 3500 revolutions per minute. The total serum cholesterol and triglycerides were measured by the "Paramax" analyzer (Baxter Laboratories). The HDL cholesterol was measured by the "Express 500 Analyzer" (Ciba-Corning Company). These analysis methods are standardized to the Abdell Kendall reference method. The precision and accuracy rating is within the $\pm$ 3% (coefficient of variation) of the true value, recommended by the Laboratory Standardization Panel of the NCEP (1988). Registered laboratory technicians operated the analyzers. Control samples with known values were analyzed about every 50 samples to monitor accuracy and to demonstrate reliability of the equipment. The standardization of laboratory values and procedures, render these values highly reliable due to consistency in measurement. The laboratory values from this agency meet the referenced criteria ($\pm$ 3% of the true value) set by the NCEP. These measurements are considered highly accurate and precise (McManus, et al., 1989).

The level of LDL cholesterol was calculated using the following equation developed by Friedewald, Levy, and Fredrickson (1972):

LDL= Total Cholesterol - [HDL Cholesterol + (Triglycerides/5)].

It's advantage is that a separate measurement of lipoprotein cholesterol is unnecessary if fasting samples are obtained, triglycerides are less than 400 mg/dl, and the subject does not

> have type III hyperproteinemia. Measurement of apolipoproteins in plasma or serum may require the use of a specialized lipid center. Currently, apolipoproteins are measured by electro-immunoassay procedures or radial immunodiffusion techniques (Hayman, 1988, p. 49).

Because the equation is not accurate for individuals with triglyceride values greater than 400 mg/dl (4.52 mmol/L), these values were excluded from this analysis. This equation was tested by comparison to actual physiological measurements (Freidewald, Levy, & Fredrickson, 1972). Since there were no significant differences reported, this equation has become the standard of measurement for LDL cholesterol and is accepted by the Laboratory Standardization Panel of the NCEP (NCEP, 1988). These laboratory measures have an absolute zero point, therefore they achieve the ratio level of measurement.

The categorization of risk levels (low, moderate, and high risk for cardiovascular disease) were based on guidelines set by the NCEP (Appendices B and G). The NCEP was initiated by the National Heart, Lung, and Blood Institute (a subgroup of the National Institutes of Health). The goals of this program are to produce guidelines for the identification and treatment of high cholesterol, and to increase cholesterol awareness and dietary changes in the general public. The NCEP established several expert panels charged with the development of recommendations and guidelines on topics crucial to the success of the program. The first of these panels, the Expert Panel on Detection, Evaluation, and Treatment of High Blood

Cholesterol in Adults (Adult Treatment Panel [ATP]), developed new guidelines for the classification and treatment of individuals with high blood cholesterol levels. Another of these panels is the Laboratory Standardization Panel. These panels are comprised of nationally recognized experts and researchers in order to establish standards for the management of high cholesterol in the United States (National Institutes of Health, 1985); therefore, these guidelines have expert validity (Appendices A and G). Since the establishment of these guidelines in 1988, a few work based intervention studies have been instituted based on them (Glanz, 1988). However, long range prospective studies are needed to establish reliability and validity of these guidelines.

In this study, the laboratory measures were reported in terms of mg/dl. The risk levels were labeled as low, moderate or high risk for cardiovascular disease. In each case the number of risk factors reported from each subject and their cholesterol values were be compared to the guidelines and the category of risk was then assigned (Appendix B). These data achieved the nominal level of measurement. The categories were mutually exclusive and exhaustive, the quantity of the attribute (risk level) was identified but the intervals between categories cannot be measured. Although, LDL levels have specific numerical values, the risk factors (ie. obesity, diabetes, etc.) could not achieve this level of measurement, therefore, measurement required nominal level statistics.

Data Collection

Data collection was based on review of medical records and the computer data base established for the C.A.R.E. program. During the process of administering the program, this researcher entered demographic information and laboratory lipid values into a main frame computer database as soon as received. This collection process continued over a period of one year. As new participants entered the program and attended the class, the information was entered in the computer database. When follow-up results were obtained and new treatment prescriptions were ordered, this information was updated into the computer entry screen for each individual (Appendix J). The average time span between screening and class attendance was approximately two weeks (classes were held twice weekly). The follow-up evaluations were accomplished between three to six months after the subjects attended the class and received their instructions (Figure 3).

Limitations

The intent of this study was to examine the serum lipid levels of a specific group of individuals before and after participation in the C.A.R.E. program. Since this was a retrospective study, the data collection was limited to one group and in one setting. The type of demographic data collected was limited to that which was incidentally obtained during the program. The research design was weakened by the lack of a control group (also due to the limitations

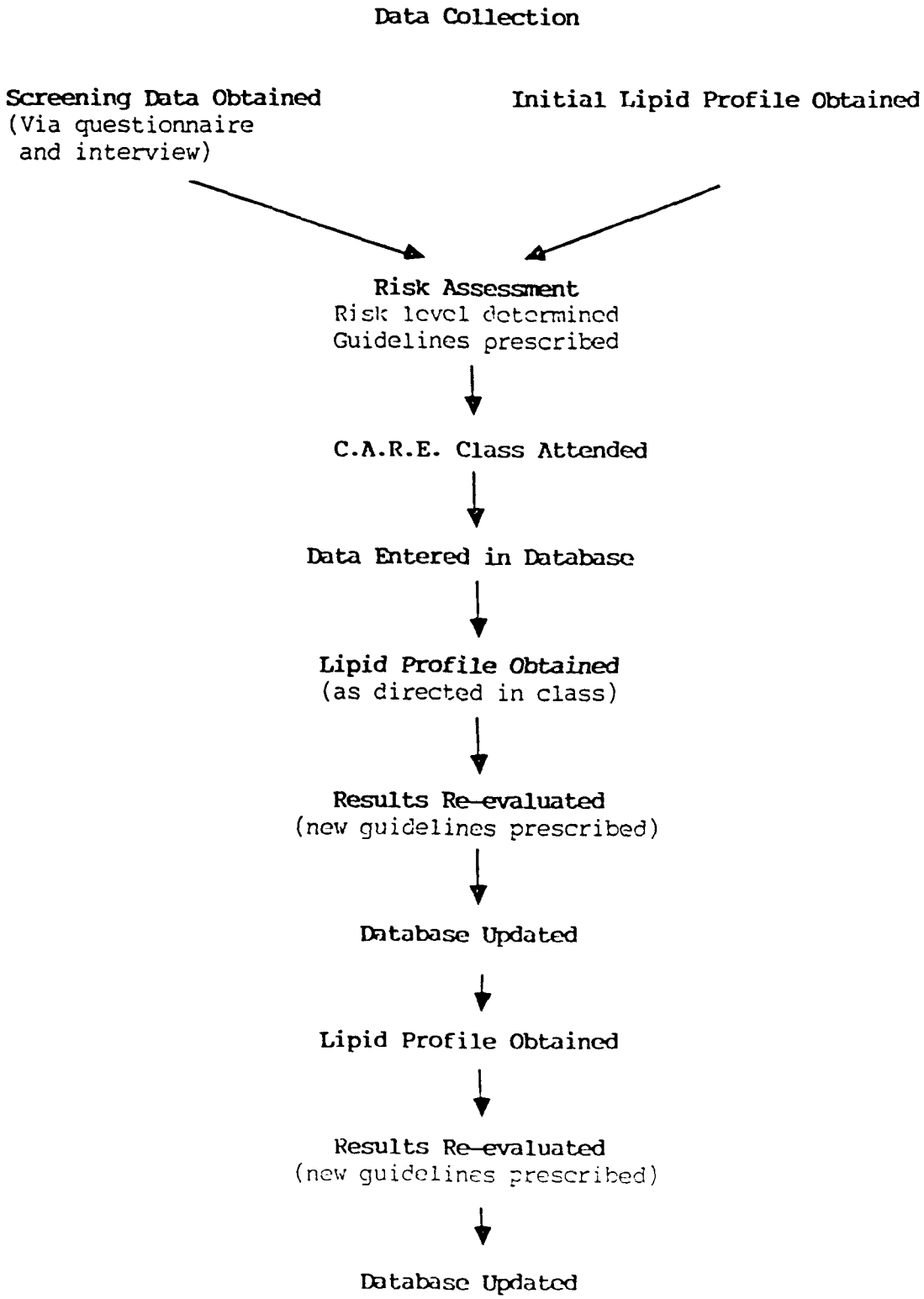


Figure 3. Flow Diagram of Data Collection

of using retrospective data). Therefore, the results are applicable only to this specific program, the study group and to one setting. The findings from this study have limited generalizability beyond adding support to the use of the Precede Model for health education programs. In addition, due to the recent establishment of cardiovascular risk level categories (low, moderate, and high) by the Expert Panel (1988), few studies have been completed using these parameters. Therefore, they have limited validity and reliability at this point in time.

CHAPTER V

RESULTS

This chapter is devoted to the description of data analysis and results of analyses. The data were using both manual and computer techniques. Statistical tables and figures are included to enhance the presentation of the results.

Analysis of Data

The sample characteristics of age and gender were examined at the start of the study. The sample consisted of 92 males and 103 females. Of the male subjects, 35 were on active duty and 58 were retired from active duty military status. Of the female subjects, 19 were dependents of active duty personnel and 83 were dependents of retired from active duty military service. The sample included 36 married couples. The subjects' ages ranged from 20 to 80 years with a mean age of 53.33 years ($\pm$ 13 S.D.). The physiological variables of height, weight, blood pressure (BP), heart rate, and serum glucose were also measured pre-treatment. The mean, standard deviation (S.D.) and range for each physiological variable are provided in table 1. The body mass index (BMI) was calculated based on the individual's height and weight (kg/cm^2); this measure provides an indication of the individual's body size. The following are BMI numbers and their corresponding size category: lean, 19; average, 25; and heavy, 31.0 (Kwiterovich, 1989).

Table 1.--Means, Standard Deviations, and Ranges of the Physiological Attributes of the Sample (n=195)

	$\bar{X}$	S.D.	Range
Height (inches)	65.94	3.25	56 - 72
Weight (lbs)	154.86	23.06	110 - 220
BMI (Kg/cm^2)	25.03	2.82	19.57 - 37.19
Systolic BP (mm Hg)	135.08	17.72	100 - 178
Diastolic BP (mm Hg)	82.98	8.51	54 - 102
Heart Rate	85.33	8.11	64 - 104
Serum Glucose (mg/dl)	97.83	13.83	72 - 130

Presence of non-lipid risk factors, such as cigarette smoking, history of coronary artery disease, hypertension, obesity, and family history of coronary artery disease, were assessed for the sample group. Cigarette smoking was reported by 22.1% of the subjects. Evidence of coronary artery disease was present for 3.1% and hypertension was present for 15.9% of the subjects, as documented in the subjects' medical records. Obesity (greater than or equal to 30% over ideal body weight) was present in 5.6% of the group. The most prevalent non-lipid risk factor was a family history of coronary artery disease; 37.4% of the group reported that definite myocardial infarction or sudden death had occurred before the age of 65 years in a parent or sibling.

Age and the physiological variables of height, weight, BMI, arterial blood pressure, heart rate, glucose levels and the baseline

(pre-treatment) lipid measurements were correlated using the Pearson's r. The significance level was set at an alpha of .05 and several significant correlations were noted between age and physiological variables. Age correlated significantly with systolic blood pressure (r=0.28, p=0.000), total cholesterol (r=0.32, p=0.000), LDL cholesterol (r=0.25, p=0.003) and cardiovascular risk level (r=0.23, p=0.0009). These relationships were all supported in the literature (Castelli, Garrison, Wilson, Abbott, Kalousdian, & Kannel, 1986).

The individual's body mass index (BMI) was significantly correlated with systolic (r=0.28, p=0.000) and diastolic blood pressure (r=0.21, p=0.0028). The BMI also correlated with total cholesterol (r=0.18, p=0.0119), LDL (r=0.18, p=0.0117), and glucose levels (r=0.16, p=0.0241). The significant correlation of BMI to blood pressure and serum lipids is consistent with clinical data from the Framingham Study (Kannel, Dawber, Friedman, Glennon & McNamara, 1964).

Systolic blood pressure (BP) correlated significantly with total cholesterol (r=0.55, p=0.0000), LDL cholesterol (r=0.36270, p=0.0000), and cardiovascular risk level (r=0.27, p=0.0001). Diastolic BP correlated significantly with total cholesterol (r=0.30, p=0.0000), LDL cholesterol (r=.22, p=0.0017), and cardiovascular risk level (r=0.15, p=0.0315). Heart rate also had a significant correlation with cardiovascular risk level (r=0.25, p=0.0004).

Significant positive correlations were noted between cardiovascular risk level and total cholesterol (r=0.67, p=0.0000) and LDL cholesterol (r=0.80, p=0.0000), which is supported in the literature

(LRC, 1984). Increased total and LDL cholesterol and a decreased HDL level is associated with an increased risk for heart disease (Expert Panel, 1988). An interesting finding, however, was that for this sample the HDL cholesterol did not correlate significantly with cardiovascular risk level, as cited in the literature (LRC, 1984).

Hypothesis Testing

Each hypothesis is presented, followed by the appropriate data analyses and results.

Hypothesis 1. There is a reduction in the mean laboratory values of total serum and LDL cholesterol, and an increase in HDL cholesterol levels of military members post-participation in the C.A.R.E. program.

The first hypothesis was tested using the one tailed t-test for dependent groups. Alpha was set at .05; baseline and follow-up mean total serum, LDL, and HDL cholesterol levels were tested for differences (Table 2). Reductions were noted for the measured total serum and the LDL cholesterol levels post-treatment. The mean total serum cholesterol was reduced by 33.82 mg/dl (t_{194}= -16.76, p= 0.0000) and the mean LDL level was reduced by 28.97 mg/dl (t_{194}= -15.22, p= 0.0000). The mean HDL cholesterol was increased by 2.75 mg/dl (t_{194}= 3.27, p= 0.0006). The hypothesis was accepted by the achievement of significant reductions in mean serum cholesterol and LDL levels and an increase in HDL levels post-treatment (Figure 4).

Hypothesis 2. There is a decrease in cardiovascular risk levels of military members post-participation in the C.A.R.E. program.

Table 2.—Baseline and Follow-up Mean Cholesterol Levels (mg/dl) in Study Population (n=195)

Type of Cholesterol	Baseline		Follow-up			
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	t-value	P
Total Serum Cholesterol	257.20	36.43	223.38	34.05	-16.76	0.0000
LDL Cholesterol	170.40	36.52	141.43	32.24	-15.22	0.0000
HDL Cholesterol	44.83	15.01	47.58	13.00	+3.27	0.0006

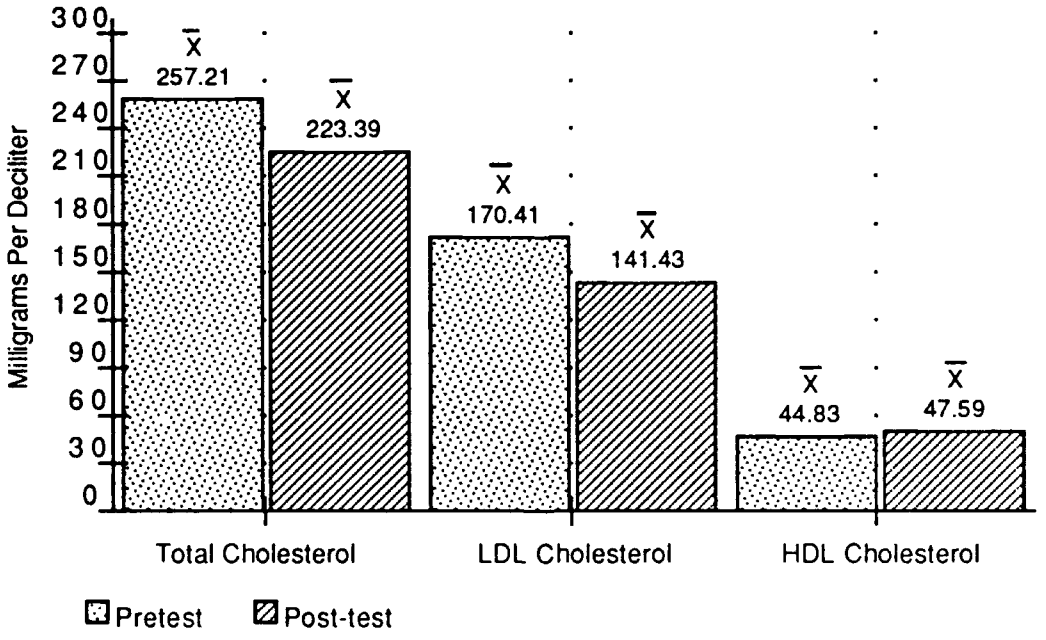


Figure 4. Presentation of mean cholesterol scores pre and post treatment.

The second hypothesis was tested using an extension of the McNemar Test for Significance of Changes, with an alpha set at .05 (McNemar, 1947; Bowker, 1948). Using a 3x3 table, the sample was categorized into low, moderate and high risk for cardiovascular disease based on the serum lipid profile and non-lipid risk factors, pre- and post-treatment (Table 3).

Table 3.--Pre-treatment Categories and Post-treatment Categories Number of Subjects and Percentage of Total (n=195)

Category	Pre-treatment		Post-treatment	
	Frequency	%	Frequency	%
High Risk	116	59.5	45	23.1
Moderate Risk	50	25.6	71	36.4
Low Risk	29	14.9	79	40.5

The subjects served as their own control and the group was compared pre- and post-treatment (Figure 5). Significant changes in risk factor categorization were noted. The value of X^2 for the sample group was 98.285 (P=0.0000); the critical value is X^2 .95, 3 = 7.815. The X^2 value was 12.6 times larger than the critical value of $X^2_{0.95, 3}$, demonstrating a significant difference in the cardiovascular risk levels of the group post-treatment. Therefore, the second hypothesis was accepted.

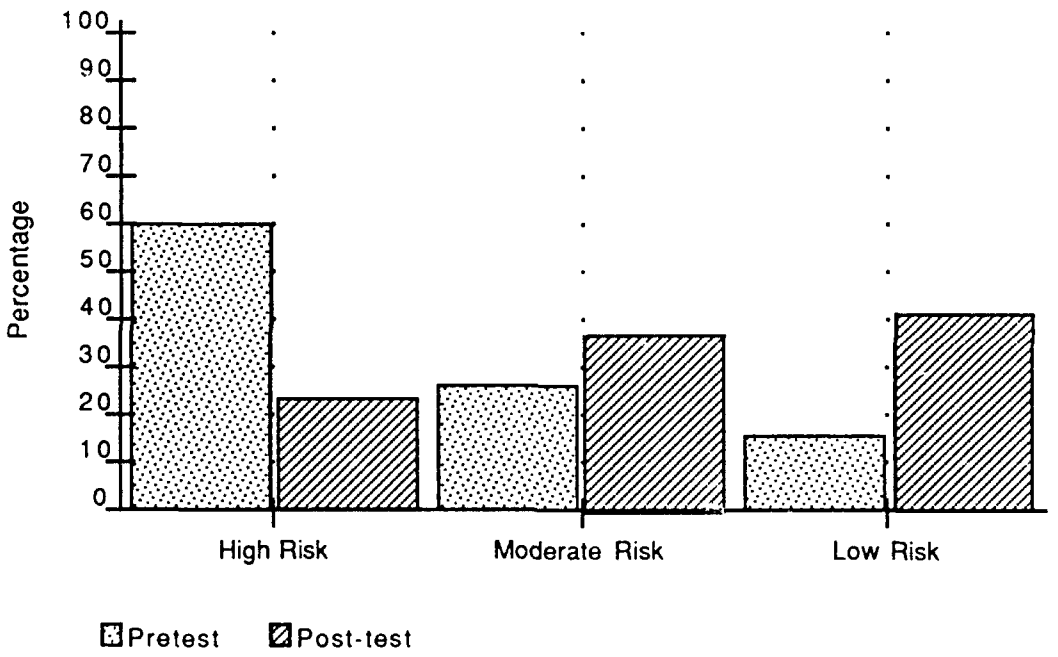


Figure 5. Cardiovascular risk status pre and post treatment.

Summary

Sample characteristics provided an overview of the non-lipid risk factors, physiological attributes, and baseline serum lipid values for the group. The three most prevalent non-lipid risk factors identified in the sample were a family history of CAD (a non-modifiable risk factor), cigarette smoking and hypertension (modifiable risk factors). In addition to non-lipid risk factors, several significant correlations were noted among the physiological variables. The most notable were between the total and LDL cholesterol levels and C-V risk, BMI, systolic and diastolic blood pressure, and age.

Hypothesis testing revealed statistically and clinically significant findings. Reductions in the mean total cholesterol and LDL cholesterol, and an increase in HDL cholesterol levels demonstrated the desired health outcomes of the C.A.R.E. program, as identified in the theoretical framework. These changes in cholesterol levels resulted in differences in cardiovascular risk categorization of the sample, after participation in the program. The level of risk for cardiovascular disease was significantly reduced after participation in the program for the majority of the sample.

CHAPTER VI

DISCUSSION

This chapter includes the interpretation of the major findings from this study. A synthesis of study results and general conclusions are explored and presented. The potential impact of this research is considered through a discussion of it's relation to theory and implications for nursing practice. This chapter concludes with recommendations for future research.

Interpretation of Major Findings

There is an increased emphasis on identifying subjects who are at risk for cardiovascular disease (CVD). The National Cholesterol Education Program (NCEP) has provided the impetus and guidelines for this effort. This study provides insight into one health education program which, utilizing NCEP guidelines, addresses the identification, treatment, and outcomes of individuals at risk for CVD.

Results of Screening

The screening program used in this study was designed to detect and reduce elevated blood cholesterol levels. However, the screening process was also beneficial in the identification, of individuals with potentially serious health problems. Because the

NCEP guidelines require information on other risk factors (e.g., smoking, hypertension, diabetes, and obesity) in order to classify participants, the screening program called attention to these factors. As discussed in Chapter IV, 15 subjects were referred immediately for medical intervention due to dangerously high cardiovascular risk levels (cholesterol levels greater than 300 mg/dl and/or multiple other risk factors). Aside from these individuals, two other screening parameters warrant attention. Eleven subjects were referred for medical evaluation of hypertension and six subjects for elevated fasting serum glucose levels. These individuals had underlying conditions which had not been previously detected. A total of 32 subjects benefited solely by the health screening portion of the C.A.R.E. program. For this sample, the screening process was successful in identifying individuals with definite health alterations.

Sample Attributes

Several correlations were noted among the physiological variables that were measured prior to participation in the C.A.R.E. program. These correlations lend support to the view that cardiovascular (C-V) risk factors are additive in nature and ultimately increase risk for coronary artery disease (Cornett & Watson, 1984).

Age had statistically significant (p=.05) correlations with blood pressure, total cholesterol, LDL cholesterol, and C-V risk. BMI also had significant (p=.05) correlations with systolic blood

pressure, total cholesterol, and LDL cholesterol. However, these correlations were very small, they ranged from 2.56% to 10.24% of the variance. Strong correlations, which accounted for a large percent of the variance, were noted between systolic blood pressure and serum lipid values. Systolic blood pressure had statistically significant correlations with total cholesterol (30.25% of the variance), LDL cholesterol (13.15% of the variance) and cardiovascular risk (7.29% of the variance). Diastolic blood pressure correlated with total cholesterol (9%), LDL cholesterol (4.84%) and C-V risk (2.25%).

The strongest correlations were between C-V risk and the total cholesterol level (44% variance explained) and the LDL cholesterol level (64% variance explained). However, HDL cholesterol did not correlate significantly with C-V risk level; which is unexpected because the literature supports this correlation (LRC, 1984; Fricke, et al., 1987, Levy, et al., 1984; Popcock, Shaper, & Phillips, 1989). The NCEP utilizes the total cholesterol and the LDL cholesterol levels as major determinants of C-V risk in their guidelines, which supports the correlations found in this sample.

Data from the Framingham Study (1964) and the Lipid Research Clinics Coronary Prevention Trial (1984) demonstrated strong links between these physiological variables and C-V risk in a cumulative manner. Thus, these correlations, with the exception of HDL cholesterol and C-V risk, are consistent with findings from other studies.

Cardiovascular Risk Reduction

An important finding was the significant 13.15% decrease in the mean total serum cholesterol level after participation in the C.A.R.E. program. This percentage compares favorably with other health education intervention efforts. Several non-pharmacologic C-V intervention studies reported reductions in total serum cholesterol levels: Lefebrve, et al. (1986) reported a 10-14% average reduction of total cholesterol two months after participation; Quigley (1986) reported a 14% reduction in total cholesterol levels eight months post-participation; Bruno, Arnold, Jacobson, Winick, & Wynder (1983) reported an average reduction of 8.8% six months post-participation; and the Multiple Risk Factor Intervention Trial (1982) demonstrated a 6.3% reduction in total serum cholesterol after one year. The reduction in total cholesterol levels for the C.A.R.E. program participants is consistent with these findings.

Data from the Lipid Research Clinics Coronary Prevention Trial (1984) demonstrated that an 8.5% decrease in LDL cholesterol was associated with a 19% reduction in coronary heart disease risk. This provided the basis for the widely accepted assumption that for every 1% decrease in serum cholesterol there is a 2% decrease in risk for coronary heart disease. Results from the Helsinki Heart Study (Fricke, et al., 1987) also support these findings. According to this premise, a 1% reduction in serum cholesterol produces a 2% reduction in C-V risk, the participants in this study achieved an overall 26.3% reduction in risk for coronary heart disease.

There was also a significant 17% reduction in mean LDL levels post participation in the C.A.R.E. program. This is greater than was reported in the Cholesterol Lowering Atherosclerosis Study (Levy, et al., 1987) in which the non-pharmacologic treatment group achieved a 5% reduction in LDL cholesterol after 2 years. The Multiple Risk Factor Intervention Trial (1982) also reported a 5.7% reduction in LDL levels 2 years post-intervention start date. According to NCEP guidelines, an LDL level greater than 160 mg/dl constitutes high risk for C-V disease regardless of the presence of other risk factors. The participants in the C.A.R.E. Program reduced their mean LDL level from 170.40 to 140.43 mg/dl; and on the basis of this factor alone, lowered their overall classification from high risk to moderate risk.

The mean HDL cholesterol level for the study group was significantly (5.8%) increased after participation in the C.A.R.E. program. Results from the Multiple Risk Factor Intervention Trial (1982) demonstrated a 1.43% increase in the Mean HDL level for the special treatment group. The Cholesterol Lowering Atherosclerosis Study reported a 2% increase two years post-participation in the intervention. There were no lipid level results reported six months after participation in the study.

Although the Lipid Research Clinics Coronary Prevention Trial (1984), the NHLBI Type II Coronary Trial (1984), and the Cholesterol Lowering Atherosclerosis Study (Levy et al., 1987) were not designed

to test directly an HDL cholesterol hypothesis, each study found that an increase in HDL cholesterol produced a reduction in coronary heart disease. Results from the Helsinki Heart Study suggest that for every 1% increase in HDL level, there is a 3% decrease in risk for coronary heart disease (Fricke, et al., 1987). According to this premise, the study group decreased their risk for coronary heart disease by 17.4% based on this factor alone.

Another important barometer of the program's success was the change in C-V risk classification. The direction of change was generally positive in that the majority of the group either decreased their C-V risk classification or remained in the same classification after participation in the C.A.R.E. Program. Only two of the 195 participants increased their risk levels (from moderate to high risk). The Expert Panel of the NCEP recommends that risk for CVD be evaluated based not only on serum lipid values but on the presence of nonlipid risk factors as well (Expert Panel, 1988). This study was limited in that it could only measure changes in serum lipid values after participation in the program. There may have been an even greater magnitude of change in risk classification if other risk factors (such as weight loss, cessation of smoking or control of hypertension) were measured post-participation. However, based on the changes noted in serum lipid values alone, there were clinically significant reductions in C-V risk levels of the sample group.

Several caveats about the findings are in order. First, "regression toward the mean" may have been responsible for a portion

of the cholesterol reduction observed since single determinations were used to establish baseline and end of treatment blood lipid levels (Green & Lewis, 1983). In addition, use of a no-treatment control group may have facilitated the interpretation of intervention impact as well as helped determine the effect of regression to the mean (Burns & Grove, 1987). Third, information on changes in participants' eating behaviors is currently unavailable. Such information, although of interest, is secondary to the documentation of changes in serum lipid values and reductions in C-V risk classification within the scope of this study. Overall, participation in the C.A.R.E. program produced significant, healthful changes in the participants' blood lipid levels and C-V risk classification, on a short term basis.

Theoretical and Nursing Implications

The positive findings from this study lend support to the proposition that "health education is a process to reduce negative health behavior over time" (Green, Kreuter, Deeds, & Partridge, 1980). By accepting the study hypotheses, the positive relationship between the "Health Education Components of the Health Program" of the Precede Model (as operationalized by the C.A.R.E. Program) and the "Health Outcomes" component of the model (as operationalized by the improved blood lipid levels and C-V risk classification) support this theoretical relationship. The goal of health education is to influence positively the adoption of behaviors conducive to health (Green & Johnson, 1983). Although, the actual dietary and other

health enhancing behaviors could not be directly measured, clinically significant health outcomes were achieved by the participants. In addition, many persons later recounted how they eagerly sought out other supplemental information and dietary management plans to reduce their cholesterol levels. Thus, it can be inferred that health enhancing behaviors were indeed practiced to a degree which provided tangible results.

The overall short term success of this health education program demonstrates the usefulness of the Precede Model. This model provides an integrated approach for the development, implementation and evaluation of a health education intervention program. This study examined and supported one relationship indicated in the model and also described how the theoretical model guided the development of the C.A.R.E. program. It would behoove nurses and other health care professionals to consider the use of the Precede Model for the diagnosis, planning, intervention, and evaluation of health education endeavors.

"Preventive practices that can improve health, extend life, and reduce medical costs are already well known. The challenge is to better apply them" (McGinnis, 1989, p. 46). This study revealed measurable improvement in health outcomes for clients through health education. These health outcomes can ultimately affect quality of life (as noted in this study by C-V risk reduction).

"In many states, the Nurse Practice Act defines nursing as diagnosing and treating human responses to actual or potential

health problems through such services as case finding, health teaching, health counseling, and provision of care supportive to or restorative of life and wellbeing" (Brownstein, Klein, & Nierenberg, 1988, p. 1). The C.A.R.E. Program demonstrated that C-V risk evaluation and intervention can be a nurse controlled venture and have far reaching impact on the client's level of wellness. "Nurses, because of their role in hospital and rehabilitation cardiac care, are uniquely situated to identify and assume a role in the management of elevated lipid levels in patients and their high-risk family members" (Becker & Wilder, 1988). C-V risk factor education can be used by nurses to optimize post-operative risk in clients undergoing coronary artery bypass surgery (Watt, Becker, Salaita, & Pearson, 1988). It is also essential in cardiac rehabilitation programs, as well as, the general multi-service units of acute care hospitals. It is useful in the prevention, detection, and management of clients seeking to enhance C-V wellness.

Nursing interventions, such as the C.A.R.E. program, can take place in outpatient settings, worksite environments, and public health forums. In this study, C-V risk factor education was used in conjunction with voluntary screening, education and management of military members. Other similar risk reduction programs could be initiated and administered by nurses within a medical support system. This program was successfully implemented in the military setting and could be adapted in a variety of settings.

Conclusions and Recommendations for Future Research

The C.A.R.E. Program has proven to be a logistically feasible and effective intervention for the screening, detection and nonpharmacologic treatment of high risk individuals. The study population achieved significant reductions in C-V risk, thereby supporting the research hypotheses. Future research must assess the degree to which these changes are sustained over time. Coronary artery disease would not be significantly affected if cholesterol reductions are only short term. Longitudinal studies, which include accumulation of long term follow-up data on program participants and the impact of the program on other risk factors (e.g., smoking, hypertension, and weight loss), would provide valuable information on the long term effects of the intervention.

Replication of this study is recommended with the addition of a control group to strengthen the validity of the findings. Studies which assess the impact of the C.A.R.E. program on specific populations such as the elderly, minorities (e.g., hispanics, blacks, orientals), children and women would be beneficial. Other studies, such as a cost-benefit analysis, could be employed to justify the cost of the C.A.R.E. program. By comparing the cost of the program to that of treatment of high risk individuals (in hospitals or physician's offices), the potential savings in terms of health care costs and limited resources could be established. Economic appraisal could support nurses' interventions in C-V risk factor reduction and as this study

has demonstrated, nurses can facilitate these changes by effectively screening, educating, and monitoring individuals with specific needs.

APPENDIX A

OPERATING INSTRUCTIONS FOR THE C.A.R.E. PROGRAM

DEPARTMENT OF THE AIR FORCE SGHG Operating Instruction 168-14
Robert L. Thompson Strategic (SAC) Hospital
Department of Primary Care
Carswell Air Force Base, Texas 14 February 1989

CORONARY ARTERY RISK EVALUATION PROGRAM

C.A.R.E. SCREENING

This operating instruction outlines the C.A.R.E. Screening program conducted by the Department of Primary Care for all active duty members and their spouses, retirees, and dependents of retirees.

This publication is affected by the Privacy Act of 1974. Each form that is subject to the provisions of AFR 12-35, Paragraph 8, and required by publication contains a Privacy Act Statement either incorporated in the body of the document or in a separate statement accompanying each document.

1. RESPONSIBILITY:

1. The Charge Nurse, Department of Primary Care, is responsible for coordinating the C.A.R.E. Screening program in conjunction with a designated provider.

2. All staff members of the Primary Care Clinic are responsible for understanding and complying with the guidelines in this operating instruction.

2. PROCEDURES:

1. Any or all patients eligible for medical care may request C.A.R.E. Screening and evaluation. They should call or come to the reception desk at the Primary Care Clinic and request this screening. They will be given a health survey to fill out and the technician will check their B/P, Height and Weight, and annotate this on the survey. At this time the patient should be briefed as to the protocol for having their blood drawn. No alcohol for 72 hours prior. If they take medications, they may do so with water only;(no coffee, coke, or juice). The patient will be given a laboratory slip requesting an FBS, Cholesterol, Triglycerides, and HDL. They will be directed to Specimen Collection for venipuncture.

2. Once the patient fills out the survey it will be then given to the Charge Nurse. In the absence of the Charge Nurse, the NCOIC or his/her designated representative will be responsible for obtaining the surveys. Once the Charge Nurse has completed survey and the blood test results for that patient, he/she will then contact the individual patient by phone, to enroll the patient in the next available C.A.R.E. class.

3. A C.A.R.E. class will be held twice weekly at 1500 hours. At the end of the program, each patient will be advised of their lab results. Based upon their family history, lab results, lab results, and current medical profile, the following recommendations may be made.

a. Weight reduction: may include formal dietary consult.
b. Decreased cholesterol/saturated triglycerides in diet; (patient handout will be given to each individual patient).
c. Stop smoking (Smoking Cessation Class information will be provided).
d. Diabetic Class (for those individual patients with DM who have not attended the class, but may benefit from attending the C.A.R.E. classes).
e. Formal referral (i.e., IMC for those with elevated FBS, FSO for those on flying status with hyperlipidemia, etc.).
f. Follow-up with _____Clinic in _____months for repeat C.A.R.E. screening after adhering to this program.

4. Clients may be referred to this program by a provider or they may simply request to have the C.A.R.E. screen performed. In any case, all patients will be encouraged to attend the class as a part of the program. The C.A.R.E. class will focus on ways to modify each individuals lifestyle in order to live more "heart safe".

SANDRA L. BRUCE, Capt, USAF, NC
Charge Nurse, Primary Care Clinic

MARK S. LOUDEN, Capt, USAF, MC
Chairman, Dept of Primary Care

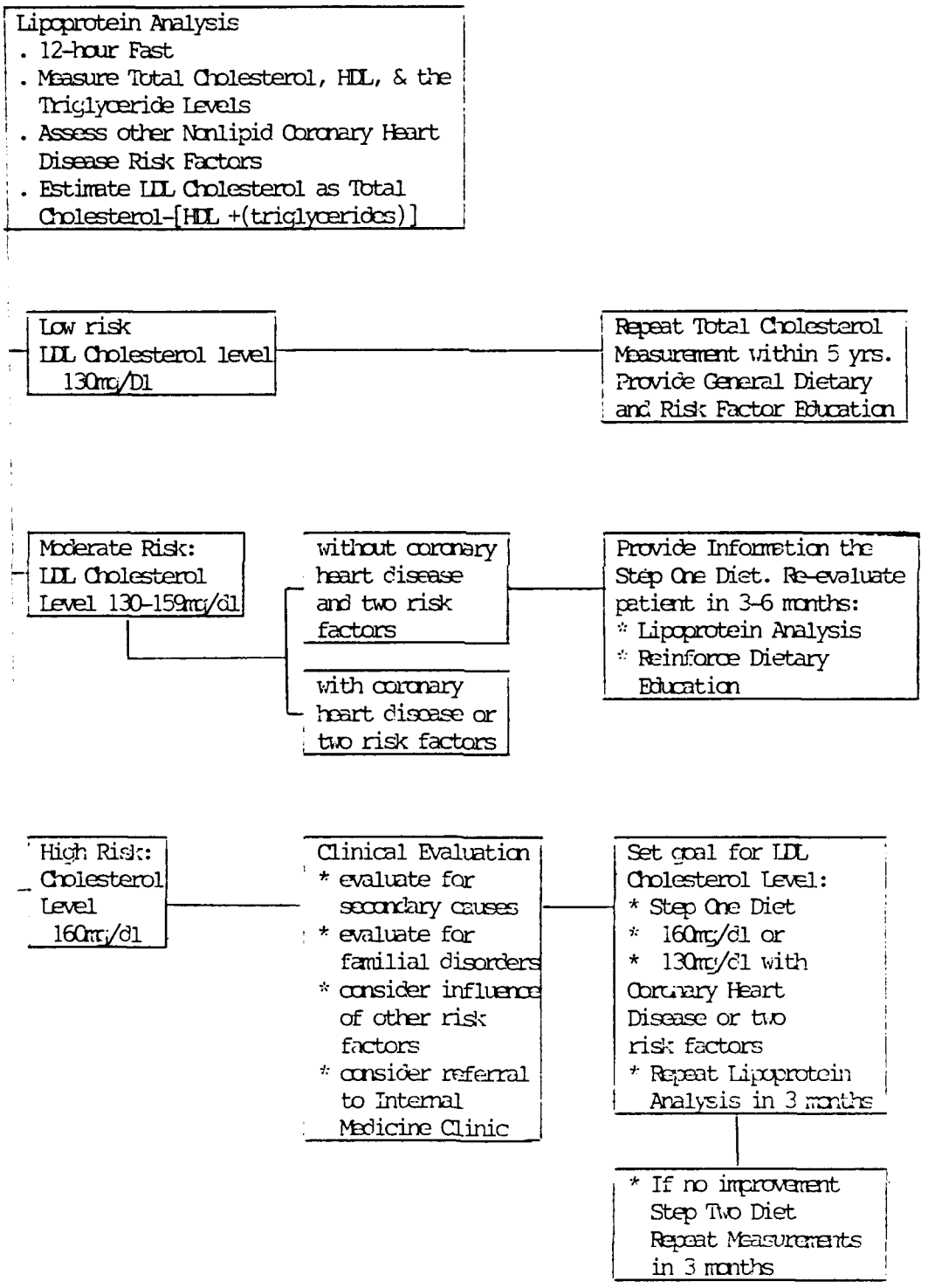
REVIEWED AND APPROVED

JAMES M. BENGE, Lt Col, USAF, MC
Director of Hospital Services

APPENDIX B

C.A.R.E. PROGRAM RISK CLASSIFICATION GUIDELINES

C.A.R.E. Guidelines Adapted From The NCEP (Expert Panel, 1988)



APPENDIX C

LIST OF RISK FACTORS FOR CARDIOVASCULAR DISEASE

RISK FACTORS FOR CARDIOVASCULAR DISEASE

The patient is considered to have a high risk status of he or she has one of the following:

Definite CAD - the characteristic clinical picture and objective laboratory findings of wither: definite myocardial infarction, or definite myocardial ischemia, such as angina pectoris.

Two other CAD risk factors:

Male gender

Family history of premature CAD (definite myocardial infraction or sudden death before age 65 years in a parent or sibling).

Cigarette smoking (currently smokes more than 10 cigarettes a day).

Hypertension

Low HDL cholesterol concentration (less than 35 mg/dl confirmed by repeated measurement).

Diabetes Mellitus

History of definite cerebrovascular or occlusive peripheral vascular disease.

Severe obesity (greater than or equal to 30% over ideal body weight).

CAD = Coronary artery disease; HDL = high density lipoproteins

Adapted from The Expert Panel. (1988). Report of the national cholesterol education program expert panel on detection, evaluation, and treatment of high blood cholesterol in adults. Archives of Internal Medicine, 148(2), 36-69.

APPENDIX D

C.A.R.E. PROGRAM INTAKE QUESTIONNAIRE

PRIMARY CARE CLINIC
ROBERT L. THOMPSON STRATEGIC HOSPITAL

C.A.R.E. Questionnaire

Date: _____

Name: (Last name first) _____, _____
Sponsor's SSAN: _____
Your Status: (example: D/W ADAF, D.W Ret Army, Ret AF, etc.) _____
Age: _____
Sex: Male/Female

PLEASE CIRCLE THE CORRECT ANSWER AFTER EACH QUESTION:

1. Family history of stroke or heart attack before age 65? Yes No

2. Do you have Diabetes Mellitus? Yes No

3. Do you have uncontrolled hypertension? (Blood Pressure consistently over 140/90?) Yes No

4. Do you smoke? Yes No

5. Are you overweight? (be honest!) Yes No

6. Are you physically inactive (do not regularly exercise aerobically, ie walking, bicycling, etc.) Yes No

7. Have you ever had a stroke, heart attack, or angina? Yes No

8. Are you already on treatment for high cholesterol? Yes No

PLEASE HAVE THE TECHNICIAN FILL OUT THE FOLLOWING INFORMATION:

BLOOD PRESSURE: _____
PULSE: _____
HT: _____
WT: _____

APPENDIX E

INITIAL C.A.R.E PROGRAM INTERVIEW FORM

PRIMARY CARE CLINIC, CAFB, TX 76127

Initial C.A.R.E. Interview

S: "I want to have my risk factors evaluated for coronary artery disease."

O:

Age:	Smoke: Yes or NO
Weight:	History of DM: Yes or No
Height:	HTN: Yes or No
B/P:	Heart Disease: Yes or No
Pulse:	Significant Family History: (MI less than age 65) Yes or No

A: Knowledge deficit related to coronary health.

P: Enroll patient in next available C.A.R.E. class: _____

Obtain baseline labs: Chol/Trig/HDL/LDL/FBS.

At the C.A.R.E. class, advise patient of their individual cardiac risk and available options for modification.

APPENDIX F

C.A.R.E. PROGRAM DIETARY GUIDELINES

Nutrient	Recommended intake	
	Step-One Diet	Step-Two Diet
Total fat	<30% of total calories	<30% of total calories
Saturated fatty acids	<10% of total calories	<7% of total calories
Polyunsaturated fatty acids	0% to 10% of total calories	0% to 10% of total calories
Monounsaturated fatty acids	10% to 15% of total calories	10% to 15% of total calories
Carbohydrates	50% to 60% of total calories	50% to 60% of total calories
Protein	10% to 20% of total calories	10% to 20% of total calories
Cholesterol	<300 mg/day	<200 mg/day
Total calories	To achieve and maintain desirable weight	To achieve and maintain desirable weight

Source: Expert Panel: *Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults*, US Dept of Health and Human Services publication No. (NIH) 88-2925. National Heart, Lung, and Blood Institute, 1988.

Recommended Diet Modifications to Lower Blood Cholesterol—The Step-One Diet

	Choose	Decrease
Fish, chicken, turkey and lean meats	Fish, poultry without skin, lean cuts of beef, lamb, pork or veal, shellfish	Fatty cuts of beef, lamb, pork, spare ribs, organ meats, regular cold cuts, sausage, hot dogs, bacon, sardines, roe
Skim and low-fat milk, cheese, yogurt and dairy substitutes	Skim or 1% fat milk (liquid, powdered, evaporated), buttermilk	Whole milk (4% fat), regular, evaporated, condensed, cream, half and half, 2% milk, imitation milk products, most nondairy creamers, whipped toppings
	Nonfat (0% fat) or low-fat yogurt	Whole-milk yogurt
	Low-fat cottage cheese (1% or 2% fat)	Whole-milk cottage cheese (4% fat)
	Low-fat cheeses (farmer or pot cheeses (all of these should be labeled no more than 2 to 6 g of fat per ounce)	All natural cheeses (blue, roquefort, camembert, cheddar, Swiss), low-fat or "light" sour cream, cream cheeses, sour cream
	Sherbet, sorbet	Ice cream
Eggs	Egg whites (2 whites equal 1 whole egg in recipes), cholesterol-free egg substitutes	Egg yolks
Fruits and vegetables	Fresh frozen, canned, or dried fruits and vegetables	Vegetables prepared in butter cream or other sauces
Breads and cereals	Homemade baked goods using unsaturated oils sparingly, angel food cake, low-fat crackers, low-fat cookies	Commercial baked goods, pies, cakes, doughnuts, croissants, pastries, muffins, biscuits, high-fat crackers, high-fat cookies
	Rice, pasta	Egg noodles
	Whole-grain breads and cereals (oatmeal, whole wheat, rye, bran, multigrain, etc)	Breads in which eggs are a major ingredient
Fats and oils	Baking cocoa	Chocolate
	Unsaturated vegetable oils, corn, olive, rapeseed (canola oil), safflower, sesame, soybean, sunflower	Butter, coconut oil, palm oil, palm kernel oil, lard, bacon fat
	Margarine or shortenings made from one of the unsaturated oils listed above, diet margarine	
	Mayonnaise, salad dressings made with unsaturated oils listed above, low-fat dressings	Dressings made with egg yolk
	Seeds and nuts	Coconut

APPENDIX G

C.A.R.E. PROGRAM WORKSHEET

Coronary Artery Risk Evaluation (C.A.R.E.)

WORKSHEET

Based on the National Cholesterol Education Program, the treatment of elevated cholesterol is directed at reducing levels of LDL (low density lipoprotein--the portion of cholesterol primarily responsible for producing cholesterol plaque within arteries) and raising levels of HDL (high density lipoprotein--the portion of cholesterol primarily responsible for reducing plaque formation).

LDL values of 130 or higher in persons with 2 or more risk factors.
or
LDL values of 160 or higher in all persons warrant intervention.

Total cholesterol levels of 200 or less are desirable.

HDL levels of 40 or above are desired.

Your laboratory tests results are:

Total Cholesterol: _____ Triglycerides: _____

HDL: _____ LDL: _____

From these findings and other factors noted previously on your history form, we recommend:

1. Follow a Low Fat/Low Cholesterol diet.
2. Regular aerobic exercise (walking, bicycling suggested).
3. Repeat your lab tests in _____ months.
4.
5.
6.

APPENDIX H

C.A.R.E. PROGRAM MEDICAL RECORD DOCUMENTATION FORM

Primary Care Clinic, CAFB, Tx, 76127
C.A.R.E. Class Note and Follow-up

S: Patient desires to know their individual cardiac risk and available options for modification.

O: Chol: _____ Trig: _____

HDL: _____ LDL: _____

FBS: _____

Positive risk factors (i.e., overweight, smoke, history of CAD, and/or family history):

A: Based on these results, you do/do not have a significant risk of developing coronary heart disease.

P: To promote prevention and intervention, the patient was given instructions regarding lipids and other forms of coronary risk modification, using the classroom setting. An opportunity was provided for questions and specific follow-up suggested:

- Weight reduction (patient hand-out given)
- Stop smoking (smoking cessation classes offered via Hospital Information Desk and patient hand-out given
- Blood Pressure check
- IMC Diabetic class offered (for previously DX DM)
- Formal dietary consult given
- Suggest follow-up (PCC in ___ months)
- Others:

APPENDIX I

REQUEST FOR AGENCY CONSENT, AGENCY REPLY LETTER AND UNIVERSITY HUMAN RESEARCH REVIEW COMMITTEE EXEMPTION LETTER

REPLY TO
ATTN OF: Sandra L. Bruce, Capt, USAF, NC 6 April 1990
SUBJECT: Agency Consent to Conduct Research
TO: R.L. Thompson Strategic Hospital (SAC)/SGA

I am currently an AFIT nursing student in the masters program at the University of Texas at Arlington. I am conducting a research study that will examine the effect of a coronary artery risk evaluation and education program on serum lipid values. I am requesting consent to conduct my study based on data generated through the coronary artery risk evaluation program (C.A.R.E.).

While I was assigned to the R.L. Thompson Strategic Hospital, I managed the C.A.R.E. program in the Primary Care Clinic from August, 1988 to July, 1989. During that time I established a computer data base in the WANG system which recorded demographic data and laboratory results of lipid values pre and post participation in the the C.A.R.E. program. This was done to efficiently track patient progress. Program participation was also documented in the patient's medical records as well.

I am requesting permission to use this data for my study. Since this is a retrospective study, there will be no patient contact. In addition, I will only use the data recorded in the database. In some instances review of the participant's medical records may be necessary to update

this data. The Privacy Act of 1974 will be strictly upheld. No identifying data (such as name and social security number) will be utilized for this study. The data will be coded numerically so that information obtained will not will not be traceable to any particular subject.

I will need a written statement from the R.L. Thompson Strategic Hospital's approval authority granting me access to this information and permission to use this data for my study. Please indicate whether or not the hospital is to be credited as the research agency for this study. If the hospital is not to be identified, the source of the data will remain anonymous.

I believe the results of this study could be beneficial to the Air Force. It would be helpful to know if our patient population truly benefits by interventions such as the coronary artery risk evaluation program, as was conducted at this facility. If permitted, the results of this study will be provided to the hospital for consideration. Thank-you in advance for your consideration. You may contact me at my home, (817) 346-0721) if there are any questions.

Sandra L Bruce

SANDRA L. BRUCE, Capt, USAF, NC

DEPARTMENT OF THE AIR FORCE
ROBERT L THOMPSON STRATEGIC HOSPITAL SAC
CARSWELL AIR FORCE BASE TEXAS 76127 5300

Sandra L. Bruce, Capt, USAF, NC
6364 Hulen Bend Court Apt # 925
Fort Worth, TX 76132

01 AUG 1990

Capt Bruce

Your request to conduct a data analysis study entitled, "Effect of a Coronary Artery Risk Evalustion Program on the Serum Lipid Values of a Selected Military Population" has been approved by this facility's Institutional Review Committee.

We look forward to receiving the final report. Please keep us informed.

JOHN S. NALL, Lt Col, USAF, MC
Chairman, Institutional Review Committee

The
University of Texas
at
Arlington

School of Nursing
Box 19407
Arlington, Texas 76019-0407
Voice 273-2776
Fax# 817-794-6006

TO: Office of Sponsored Projects

FROM: Barbara S. Heater, R.N., Ph.D.,
Member of Human Research Review Committee

SUBJECT: Principal Investigator: Sandra Lynn Bruce

Title of Prospectus: The Effects of a Coronary Risk Evaluation Program on the Serum Levels of a Selected Military Population.

According to the guidelines of The Human Research Review Committee, the above named prospectus poses no risk to human subjects and qualifies for exempt status under current Department of Health and Human Services regulations (45 CFR Part 46). No further review of the project is therefore required. However, it should be noted that any change in the study as it is described in the prospectus could affect its status and necessitate HRRC review.

APPENDIX J

C.A.R.E. DATABASE COMPUTER ENTRY SCREEN


WORKSTATION 160 - USER OPS - Lab Central Operations
1:44:52 PM Monday February 5, 1990
CARE ENTRY SCREEN
Robert L Thompson Strategic Hospital, Carswell AFB, Tx.
Privacy Act 1974
SEX: MALE==> FEMALE==> 1
Lname: NIACIN Fname: LINDA MI
(QU_STRAN,LOPID,NIACIN)
diet: LOFAT/CHOL (LOFAT/CHOL,STEP I/II,TYPE IV) diet date: 891122
HX:CSM ,HTN ,DM ,CAD ,EXCAD ,OTS)
REMARKS F/U 12-24 MOS
FOLLOW-UP DATE====> 891122
PF1-Return to Find Mode PF2-First PF5-Next PF9-Modify Record PF12-Delete
** Display Mode **

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